Condition 30

Appendix 5C1

Burnaby Terminal - Power System Study with Short Circuit Analysis, Arc Flash, and Protection Coordination Study

TRANSMOUNTAIN

Trans Mountain Expansion Project

Burnaby Terminal – Power System Study with Short Circuit Analysis, Arc Flash, and Protection Coordination Study

KMC Document # 01-13283-TB-BB02-TTF-RPT-0001

KINDER MORGAN CANADA INC.

Rev No.	Prepared by/ Date	Reviewed by/ Date	Approved by/ Date	TMEP Acceptance/ Date	Pages Revised	Issued Type
A	L. Fotoohi 2017-01-31	D. Dapcevic 2017-01-31	K. Savage 2017-01-31			Issued for Review
B	L. Fotoohi 2017-02-10	D. Dapcevic 2017-02-10	K. Savage 2017-02-10			Issued for Information

TRANS MOUNTAIN

Power System Study

Burnaby Terminal

Power System Study with Short Circuit Analysis, Arc Flash, and Protection Coordination Study

Prepared by:

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Project No. 719-216239.00

Document No. 01-13283-TB-BB02-TTF-RPT-0001, Rev. B

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Revision Table

Rev	Status	Issue Date	Originator	Checker	Approver
B	Issued for Information	February 10, 2017	L. Fotoohi	D. Dapcevic	K. Savage
A	Issued for Review	January 31, 2017	L. Fotoohi	D. Dapcevic	K. Savage

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Abbreviations

Abbreviation	Definition
ATS	Automatic Transfer Switch
CTI	Coordination Time Interval
CSA	Canadian Standards Association
FCT	Fault Clearing Time
IEEE	Institute of Electrical and Electronics Engineers
LSIG	Long-time Short-time Instantaneous Ground
MCC	Motor Control Center
NGR	Neutral Grounding Resistor
PPE	Personal Protective Equipment
TCC	Time Current Curve
TMEP	Trans Mountain Expansion Project
VFD	Variable Frequency Drive

1.0 INTRODUCTION

This Power System Study applies to the Trans Mountain Expansion Project (TMEP) Burnaby Terminal power distribution system. The future terminal equipment has been evaluated for short circuit currents and for arc flash incident energy and protective device coordination.

Power comes to the terminal via two 12.47 kV feeders from BC Hydro. These utility feeders are known as the Shellmont feeder and the Aubrey feeder. The voltage levels covered in this study are 12470 V, 4160 V, 600 V, and 480 V; this includes transformers, switchgear, all Motor Control Centers (MCCs), and any other major connecting points.

The information sources for this study are from Burnaby Terminal preliminary design single line diagrams and a software model of the existing part of the system developed for the 2008 Arc Flash Study. The data required to perform the analysis consists of fault contribution; equipment ratings; feeder data; transformer data; and protection device make, model, and their associated settings. Since part of the system has not yet been built, most values are based on preliminary design information.

The Power System Study was prepared using PowerTools for Windows, Version 7.0, developed by SKM System Analysis Inc.

1.1 Short Circuit Study – Objectives and Standards

The objectives of the Short Circuit Analysis are as follows:

- Calculate fault levels for buses 480 V and above.
- Evaluate equipment ratings versus available fault levels.
- Identify equipment at which fault levels are a concern and provide recommendations where relevant.

Bolted short circuit calculations used in this study comply with the standards in Table 1.

Table 1: Bolted Short Circuit Calculation Standards

Standard	Title
ANSI C37.010	IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
ANSI C37.5	Guide for Calculation of Fault Currents for Application of AC High-Voltage Circuit Breakers Rated on a Total Current Basis
ANSI C37.13	Low-Voltage AC Power Circuit Breakers Used in Enclosures
IEEE 141-1993	IEEE Recommended Practice for Electric Power Distribution for Industrial Plants – Red Book

1.2 Arc Flash and Protection Coordination Study – Objectives and Standards

The objectives of the Arc Flash and Protection Coordination Study are as follows:

- Complete a combined Arc Flash and Protection Coordination Study.
- Prepare Time Current Curves (TCCs) to clearly demonstrate the coordination method and settings, and summarize the findings in a report including Protective Device Coordination Time Interval (CTI).
- Complete Arc Flash Study for all buses 480 V and above to meet the requirements of Canadian Standards Association (CSA) Z462.
- Prepare an Arc Flash Evaluation Report to summarize the data used in calculations, the arc flash levels, and recommendations.
- Review results of the study and recommended Personal Protective Equipment (PPE) requirements.
- Recommend possible improvements to decrease arc flash levels and improve coordination.

The standards in Table 2 were used to evaluate protective device coordination and arc flash incident energy levels, and to determine PPE.

Table 2: Arc Flash and Protection Coordination Study Calculation Standards

Standard	Title
IEEE 242-2001	IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)
CSA Z462-15	Workplace Electrical Safety
IEEE 1584-2002	IEEE Guide for Performing Arc-Flash Hazard Calculations

The purpose of coordination is to isolate faults selectively in the shortest time with minimum system shutdown. All protective devices between the motor and the source of power must be set and sized to coordinate with each other to ensure that only the faulted area is disconnected from the circuit.

1.3 Facility Power System Description

The Burnaby Terminal is fed from BC Hydro, Shellmont, and Aubrey substations via two 12.47 kV feeders to the incoming disconnect switches at each of the Trans Mountain owned 12.47 kV indoor Substations BB-SUB1 and BB-SUB2. The power from the Shellmont feeder is further distributed from the 12.47 kV circuit breaker to Substation 1 Transformer SUB1-TXR. The power from the Aubrey feeder is further distributed from the 12.47 kV circuit breaker to Substation 2 Transformer SUB2-TXR. A 15 A, 10 second rated Neutral Grounding Resistor (NGR) is located at the secondary winding of each substation transformer and will limit any ground faults to 15 A, preventing any ground fault related arc flash event.

1.3.1 New Substation 1 (BB-SUB1) Equipment

Refer to single line drawings in Appendix 4.

From 12.47 kV Substation BB-SUB1, power is distributed through the main incoming breaker SUB1 Breaker and Power Transformer SUB1-TXR to 12.47 kV Substation 1 Power Distribution Center SUB1-PDC. The Transformer SUB1-TXR is dual rated primary (12.47 kV and 25 kV) due to the BC Hydro upgrade program to convert 12.47 kV circuits to 25 kV circuits for future expansion of the utility system. BC Hydro is paying the incremental cost difference for the 12.47/25 kV primary of the transformer. In this study, the voltage level of 12.47 kV is considered. SUB1-PDC houses circuit breakers for existing Power Distribution Center SUB1-PDC1A and new Power Transformers BB-ESB1-TXR1 and BB-ESB2-TXR1 that distribute power further to the low voltage Motor Control Centers (MCCs) BB-ESB1-MCC and BB-ESB2-MCC.

Details of Substation Transformer SUB1-TXR are provided below:

Voltage	12.47 kV to 12.47 kV
Power	5 MVA KNAN
Percent Impedance	8.00 %
Winding Connection	Delta-Wye Connected (15A High Resistance Grounded)
Primary Winding Tap Setting	0 %

Ground fault protection at the 12.47 kV level downstream of SUB1-TXR is performed by a ground fault relay and a 15 A, 10 second NGR located at the secondary of the substation transformer. Ground fault current in the system is limited to 15 A and is quickly interrupted by the ground fault relay and upstream SUB1 Breaker before it reaches the NGR design limit of 10 seconds. A 15 A NGR prevents arc flash events due to ground fault currents.

Power Transformers BB-ESB1-TXR1 and BB-ESB2-TXR1 further distribute power to low voltage MCCs BB-ESB1-MCC and BB-ESB2-MCC and have following details:

Voltage	12.47 kV to 600 V
Power	2 MVA KNAN
Percent Impedance	6.00 %
Winding Connection	Delta-Wye Connected (Solidly Grounded)
Primary Winding Tap Setting	0 %

Each of the 600 V MCCs (BB-ESB1-MCC and BB-ESB2-MCC) has the capability to be fed from an emergency generator via an Automatic Transfer Switch (ATS). During outages on the utility line, a limited amount of essential loads are powered by the emergency generators. Therefore, an alternate scenario was considered for this study.

Each low voltage 600 V MCC is fed from a solidly grounded transformer. Ground faults are cleared by breakers on instantaneous trip. As a worst case scenario, tripping of the breakers is tested against the arcing current, which is substantially lower than the bolted fault current. This approach ensures that any arcing currents that may develop in the 600 V system are quickly cleared by the instantaneous trip of the breakers.

The study evaluated two operation scenarios for the Substation 1 for two existing 500 HP jet fuel pumps fed from a 5 kV switchgear. As one of these motors is the complete backup for the other motor, one motor is considered to be running in the first scenario. Therefore, the following scenarios were considered:

- Only one (1) jet fuel pump is running.
- None of jet fuel pumps are running.

1.3.2 New Substation 2 (BB-SUB2) Equipment

Refer to single line drawings in Appendix 4.

From 12.47 kV Substation BB-SUB2, power is distributed through the main incoming breaker SUB2 Breaker and Power Transformer SUB2-TXR to the 4.16 kV Substation 2, Power Distribution Center SUB2-PDC1. The Transformer SUB2-TXR is dual rated primary (12.47 kV and 25 kV) due to the BC Hydro upgrade program to convert 12.47 kV circuits to 25 kV circuits for future expansion of the utility system. BC Hydro is paying the incremental cost difference for the 12.47/25 kV primary of the transformer. In this study, the voltage level of 12.47 kV is considered. SUB2-PDC1 houses circuit breakers for existing Distribution Transformers LC3-TXR1 and LC4-TXR1 to existing MCCs LC3-MCC and LC4-MCC and new Power Transformers BB-ESB3-TXR1, BB-ESB4-TXR1, and BB-ESB5-TXR1 that distribute power further to low voltage MCCs BB-ESB3-MCC, BB-ESB4-MCC, and BB-ESB5-MCC.

Details of Substation Transformer SUB2-TXR are provided below:

Voltage	12.47 kV to 4160 V
Power	1.5 MVA KNAN
Percent Impedance	8.00 %
Winding Connection	Delta-Wye Connected (15A High Resistance Grounded)
Primary Winding Tap Setting	0 %

Ground fault protection at the 4.16 kV level is performed by a ground fault relay and a 15 A, 10 second NGR located at the secondary of the substation transformer. Ground fault current in the system is limited to 15 A and is quickly interrupted by the ground fault relay and upstream SUB2 Breaker before it reaches the NGR design limit of 10 seconds. A 15 A NGR prevents arc flash events due to ground fault currents.

Power Transformers BB-ESB3-TXR1 and BB-ESB5-TXR2 further distribute power to low voltage MCCs BB-ESB3-MCC and BB-ESB5-MCC and have following details:

Voltage	4160 V to 600 V
Power	500 kVA KNAN
Percent Impedance	5.00 %
Winding Connection	Delta-Wye Connected (Solidly Grounded)
Primary Winding Tap Setting	0 %

Power Transformer BB-ESB4-TXR2 further distributes power to low voltage MCC BB-ESB4-MCC and has following details:

Voltage	4160 V to 600 V
Power	100 kVA KNAN
Percent Impedance	5.00 %
Winding Connection	Delta-Wye Connected (Solidly Grounded)
Primary Winding Tap Setting	0 %

Each 600 V MCCs (BB-ESB3-MCC, BB-ESB4-MCC, and BB-ESB5-MCC) have the capability to be fed from an emergency generator via an ATS. During outages on the utility line, a limited amount of essential loads are powered by the emergency generators. Therefore, an alternate scenario was considered for this study.

Each low voltage 600 V MCC is fed from a solidly grounded transformer. Ground faults are cleared by breakers on instantaneous trip. As a worst case scenario, tripping of the breakers is tested against arcing current, which is substantially lower than the bolted fault current. This approach ensures that any arcing currents that may develop in the 600 V system are quickly cleared by the instantaneous trip of the breakers.

2.0 SHORT CIRCUIT STUDY

2.1 Purpose

The purpose of the Short Circuit Analysis is to evaluate the short circuit current available from potential bolted faults at power equipment with a rated voltage of 480 V and above (three-phase systems). Each bus and circuit-interrupting device is evaluated versus the fault current present in the event of an electrical fault. The results were analyzed and any hardware not operating within its rated tolerances were identified. Within SKM, the A_Fault module handles all calculations related to short circuit calculations.

SKM calculates the short circuit level using the Institute of Electrical and Electronics Engineers (IEEE) Std. 141-1993 method. The main overall purpose of this study is to calculate the short circuit to determine the ratings of the load buses, fuses, isolation switches, and circuit breakers on-site.

2.2 The A_Fault Program

Fault levels are determined based on the method defined in the IEEE Red Book (IEEE Std. 141-1993).

The circuit data entered into the software model includes fault contributions, cable impedances, and transformer data. Based on this information, the following data is calculated:

- The ANSI Asymmetrical Momentary RMS duty for all high and medium voltage buses
- The ANSI Symmetrical RMS duty for all buses

Two fault levels are calculated using the IEEE Std. 141-1993 method. The momentary fault level is determined from the first cycle of the fault and the interrupting duty is determined at the point in time when the fault clearing device opens during the fault.

2.3 Fault Contributions

There are three types of fault contributions: local utility, local generators, and induction / synchronous motors.

2.3.1 Utility Fault Contributions

BC Hydro provided the fault level at the Shellmont and Aubrey lines 12.47 kV utility connections as follows:

Shellmont

Thevenin impedance (100 MVA base @ 12.47 kV)

- Z1 (pu) = 0.3367+1.5658j
- Z0 (pu) = 0.9498 +3.2272j

Aubrey

Thevenin impedance (100 MVA base @ 12.47 kV)

- Z1 (pu) = 0.7723+1.7921j
- Z0 (pu) = 2.4920 +3.7547j

2.3.2 Induction Motors

For medium voltage studies, A_Fault ignores contributions from motors rated at less than 50 HP. The multiplication factors required to determine motor fault current contribution are calculated by A_Fault when the software is run. Fault calculations are made on the basis of motor size and RPM data per Table 4-1 of IEEE Standard 141-1993, which determines the multiplication factors based on the following motor groupings:

- Motors larger than 250 HP at 3600 RPM and motors larger than 1000 HP at slower speeds
- All other motors 50 HP and larger
- All motors less than 50 HP

The Short Circuit Study for Substation 1 (BB-SUB1) has been performed with two configurations for motors connections to identify the worst case fault duties:

- None of jet fuel pumps are running.
- Only one (1) jet fuel pump is running.

The second configuration results in the highest fault duty at all buses.

The Short Circuit Study for Substation 2 (BB-SUB2) has been performed with only one (1) configuration for motor connections to identify the worst case fault duties.

2.4 Cable Impedances

Cable impedance is determined by the conductor length, size, type (copper or aluminum), and raceway type (magnetic or non-magnetic). SKM has a cable library that covers a number of the most common feeder types.

Cable characteristics were determined from the Burnaby Terminal preliminary design information.

2.5 Transformer Data

The Transformer data for transformers in Substation 1 and 2 is from the preliminary design information. The primary winding tap settings are as shown in section 1.3.

2.5.1 Transformer X/R Ratio

The transformer impedance is expressed as a complex quantity for the SKM Fault Study. Typical X/R ratios are based on Figure 4A-1 of the IEEE Red Book (IEEE Std. 141-1993).

2.6 Low Voltage Fault Duties

The three-phase symmetrical fault duty on each low voltage bus is used to determine the bus bracing for the low voltage switchgear and MCCs. The MCCs and switchgear must be rated at a value greater than the calculated fault currents to withstand the forces on the equipment without permanent damage.

When determining the required interrupting rating for low voltage circuit breakers, IEEE Standard C37.13-2008 (Table 3) recommends that a multiplication factor be applied to determine the required minimum device rating. This multiplying factor is based on the system X/R ratio and is determined by SKM A_Fault calculations when the software is run.

2.7 Medium Voltage Momentary Duties

Momentary duties occur during the first cycle of a short circuit. This fault level is used to determine the bus bracing requirements of the medium voltage switchgear and the interrupting capacity of fuses.

One method to estimate the Asymmetrical Momentary fault level is to apply a worst case multiplication factor of 1.6 to the calculated symmetrical fault level. This 1.6 factor is used to account for the direct current component of the first cycle fault, which itself is a function of the system X/R ratio.

A_Fault determines the correct asymmetric multiplication factor based on the calculated X/R ratio according to Section 4.5.4.1 of the IEEE Std. 141-1993. The asymmetric component of the fault decays with time as the contributions from motors, for example, reduces to zero at anywhere from 5 to 30 cycles, whereas the utility contribution remains constant. As breakers require a certain amount of time (some up to 8 cycles) to open their contacts, the fault current that is present at the point when the breaker contacts part, will be lower than the first cycle fault current; this value of the fault current is the interrupting duty.

Medium voltage equipment ratings are governed by ANSI/IEEE Standards C37.010-1999 and C37.5.

2.8 Results

The results of the Fault Study are reproduced on the single line diagrams attached in Appendix 1 for the Substation 1 and Substation 2 equipment, respectively. The highest faults are summarized in the appendices tables and in the sub-sections below. The medium voltage buses have three fault duties recorded on each bus, the Asymmetrical Momentary duty, Symmetrical RMS, and Symmetrical Interrupting duty. Low voltage buses have a single fault duty recorded on each bus (the Symmetrical RMS duty) known as the fault duty.

2.8.1 Substation 1 Medium Voltage Equipment

The 12.47 kV main disconnect switch at SUB1 Breaker is 40 kA rated; therefore, it is properly rated for the fault duty of 4.1 kA.

The fault level at SUB1 Breaker is 2.6 kA Momentary and 3.1 kA Interrupting. The Breaker has a Momentary rating of 26 kA and an Interrupting rating of 16 kA; therefore, the Breaker is properly rated.

The SUB1-PDC1 Bus fault current is 2.6 kA Asymmetrical Momentary. The bus bracing rating is 25 kA; therefore, SUB1-PDC1 is properly selected for this fault current.

The fault level at SUB1-PDC1A Breaker is 2.6 kA momentary and 1.7 kA interrupting. The SUB1-PDC1A breaker has a Momentary rating of 37 kA and an Interrupting rating of 18 kA; therefore, the SUB1-PDC1A breaker is properly rated.

The fault level at Main Service Switchgear is 2.6 kA Asymmetrical Momentary. The bus bracing rating is 25 kA; therefore, the switchgear is properly rated for this fault current.

The Main Service Switchgear utilizes fusing for feeder protection. Feeder fuses SW-A, SW-B, SW-E and SW-F have an Asymmetrical Momentary rating of 22.4 kA with a Momentary fault duty of 2.6 kA and a Symmetrical Interrupting rating of 14 kA with a Symmetrical Interrupting duty of 2 kA; therefore, the fuses are properly rated.

The fault level at the 5 kV switchgear is 3.5 kA Asymmetrical Momentary. The bus bracing rating is 25 kA; therefore, the switchgear is properly rated for this fault current.

The Jet Fuel Pump 1 feeder utilizes fusing for protection. The Jet Fuel Pump 1 feeder fuse has an Asymmetrical Momentary rating of 80 kA with a Momentary fault duty of 3.9 kA and a Symmetrical Interrupting rating of 50 kA with a Symmetrical Interrupting duty of 2.9 kA; therefore, the fuse is properly rated.

The Jet Fuel Pump 2 feeder utilizes fusing for protection. The Jet Fuel Pump 1 feeder fuse has an Asymmetrical Momentary rating of 80 kA with a Momentary fault duty of 3.9 kA and a Symmetrical Interrupting rating of 50 kA with a Symmetrical Interrupting duty of 2.9 kA; therefore, the fuse is properly rated.

The fault level at BB-ESB1-MCC Line Breaker is 2.6 kA Momentary and 1.7 kA Interrupting. The BB-ESB1-MCC Line Breaker has a Momentary rating of 58 kA and an Interrupting rating of 28 kA; therefore, the BB-ESB1-MCC Line Breaker is properly rated.

The fault level at BB-ESB2-MCC Line Breaker is 2.6 kA Momentary and 1.7 kA Interrupting. The BB-ESB2-MCC Line Breaker has a Momentary rating of 58 kA and an Interrupting rating of 28 kA; therefore, the BB-ESB2-MCC Line Breaker is properly rated.

2.8.2 Substation 2 Medium Voltage Equipment

The 12.47 kV main disconnect switch is 40 kA rated; therefore, it is properly rated for the fault duty of 2.5 kA.

The fault level at the SUB2 Breaker is 2.5 kA Momentary and 2.4 kA Interrupting. The Breaker has a Momentary rating of 26 kA and an Interrupting rating of 16 kA; therefore, the Breaker is properly rated.

The SUB2-PDC2 Bus fault current is 2.3 kA Asymmetrical Momentary. The bus bracing rating is 25 kA; therefore, SUB1-PDC1 is properly selected for this fault current.

The fault level at LC3-MCC LINE Breaker is 2.3 kA Momentary and 1.9 kA Interrupting. The LC3-MCC Line Breaker has a Momentary rating of 78 kA and an Interrupting rating of 41 kA; therefore, the LC3-MCC LINE Breaker is properly rated.

The fault level at LC4-MCC Line Breaker is 2.3 kA Momentary and 1.9 kA Interrupting. The LC4-MCC Line Breaker has a Momentary rating of 78 kA and an Interrupting rating of 41 kA; therefore, the LC4-MCC Line Breaker is properly rated.

The fault level at BB-ESB3-MCC Line Breaker is 2.3 kA Momentary and 1.9 kA Interrupting. The BB-ESB3-MCC Line Breaker has a Momentary rating of 78 kA and an Interrupting rating of 41 kA; therefore, THE BB-ESB3-MCC Line Breaker is properly rated.

The fault level at BB-ESB4-MCC Line Breaker is 2.3 kA Momentary and 1.9 kA Interrupting. The BB-ESB4-MCC Line Breaker has a Momentary rating of 78 kA and an Interrupting rating of 41 kA; therefore, the BB-ESB4-MCC Line Breaker is properly rated.

The fault level at BB-ESB5-MCC Line Breaker is 2.3 kA Momentary and 1.9 kA Interrupting. The BB-ESB5-MCC Line Breaker has a Momentary rating of 78 kA and an Interrupting rating of 41 kA; therefore, the BB-ESB5-MCC Line Breaker is properly rated.

2.8.3 Substation 1 Low Voltage Equipment

The 600 V MCCs and 480 V MCCs have a bracing of 42 kA. The maximum fault duty at the low voltage MCC is 23.5 kA. The lowest rated breaker is at 14 kA; however, the fault currents at the 14 kA rated breakers is 9.4 kA. Therefore, the low voltage MCCs and all low voltage breakers at the Burnaby Terminal Substation 1 are properly rated.

There are three (3) ATSs located at the Substation 1 supplied electrical system, all rated for 30 kA. The highest fault current at these ATSs is 23.5 kA and therefore all three ATSs are adequately rated for the fault currents.

2.8.4 Substation 2 Low Voltage Equipment

The 600 V MCCs and 480 V MCCs have a bracing of 42 kA. The maximum fault duty at the low voltage MCC is 7.9 kA. The lowest rated breaker is at 14 kA; however, the fault current at the 14 kA rated breakers is 9.4 kA. Therefore, the low voltage MCCs and all low voltage breakers at the Burnaby Terminal Substation 2 are properly rated.

There are five (5) ATSs at the Substation 2 supplied electrical system, all rated for 30 kA. The highest fault current at these ATSs is 7.9 kA and therefore all five ATSs are adequately rated for the fault currents.

3.0 ARC FLASH AND PROTECTION COORDINATION STUDY

3.1 Purpose

The purpose of the Arc Flash and Protection Coordination Study is to determine the incident energy during an arcing fault at power equipment with a rated voltage of 480 V and above (three-phase systems).

3.2 Arc Flash Overview

At each bus, the arc flash energy is calculated per the CSA Z462 standard. Recommendations of arc flash hazard reduction are presented where appropriate. The arc flash results are valid for a worker who is exposed to live electrical parts and when a worker is operating live electrical components, even if the doors are closed.

An arcing fault occurs when a fault current passes through the air between conductors in equipment. Arc flash incidents can result in serious injury and/or death due to the intense effects of the arcing. Use of appropriate PPE can help to reduce the severity of injury to a worker exposed to an arc flash.

The following steps were taken in this Arc Flash Study:

- Identified all three-phase buses of 480 V and higher.
- Collected equipment data including relay settings, breaker settings, fuse types, and sizes.
- Entered data into the SKM software.
- Performed an ANSI Short Circuit Analysis to calculate bolted three-phase current for each bus including branch contributions.
- Calculated the arc current for each bus using IEEE 1584 calculations.
- Analyzed the Arc Flash Evaluation Report generated by SKM.
- Provided recommendations to reduce arc flash hazard (if applicable).

The IEEE 1584 standard provides a detailed procedure to determine the energy to which a worker may be exposed.

3.3 SKM PTW Arc Flash Software Configurations

The following SKM PTW software configurations were made when conducting the Arc Flash and Protection Coordination Study:

- From the faulted bus outwards, the SKM software searches for connected protective devices, excluding ground fault devices. The study options are set to check upstream devices for miscoordination to replicate the true system configuration as accurately as possible. The fault is then cleared in sequence based on the protective device TCC trip curve. This process repeats until all branches contributing to the fault are cleared in correct sequence, as required.
- The protective device that clears the fault in the shortest time period of time is used in the arc flash calculation.
- The working distance remains constant.
- Induction motors contribute to the arcing current until removed after five cycles.
- The current-limiting range is assumed to start when the fuse clearing curve drops below 0.01 seconds when the current-limiting fuses are utilized.
- The interrupting device is rated for the available short circuit current. This assumption is confirmed by the Short Circuit Analysis.
- Motor overload devices are not included.
- The worst case incident energy is reported in the results table and single line diagrams.
- The maximum Fault Clearing Time (FCT) was set to 2 seconds. This applies where a protective device is not able or not available to clear the arcing fault at a bus, in accordance with IEEE 1584 recommendations.

3.4 Arc Flash Evaluation Report

The results of the study are summarized in Appendix 2 and 3. Terms used in the Arc Flash Evaluation Report are defined in Table 3.

Table 3: Arc Flash SKM Report Definitions

Terms	Definitions
Bus Name	Location of fault in the power system.
Protective Device Name	ID of protective device that clears the arcing fault current.
Bus Voltage (kV)	Bus voltage in kilovolts at the source of the fault.
Bus Bolted Fault (kA)	The available current in kiloamperes that can flow between two connected points with no impedance between them.
Protective Device Bolted Fault (kA)	The bolted fault current in kiloamperes that flows through the protective device clearing the fault.
Protective Device Arcing Fault (kA)	The available arcing current in kiloamperes that flows through the protective device clearing the arc fault.

Terms	Definitions
Trip / Delay Time	Total time delay required for a protective device to clear the fault current.
Breaker Opening Time	The amount of time for breakers to fully open upon initiation of an opening sequence. This time is normally measured in cycles to open.
Equipment Type	The IEEE 1584 standard defines different types of equipment when setting up an arc flash analysis. This is important because it sets the default physical characteristics of the equipment such as bus gaps and working distance.
Gap (mm)	The space between bus bars or conductors in equipment.
Ground (Y/N)	Defines the system grounding configuration. Where high resistance grounded systems are used, they are considered ungrounded.
Arc Flash Boundary	The minimum distance from exposed live parts within which a worker could receive a second degree burn during an arc flash event.
Working Distance	The distance between the arc source and the worker's face or chest. Typical working distances are specified per the IEEE 1584 standard.

3.5 Arc Flash Evaluation Interpretation

The PPE required to prevent an incurable burn at the working distance during an arcing fault is to be selected based on calculated incident energy in accordance with CSA Z462-15.

Incident energy levels above 12 cal/cm^2 require the use of a full arc rated suit. An arc flash suit is restrictive, hot, bulky, and difficult to work in, which increases the chance that a tool will be dropped or accidental contact will be made with live conductors, which may trigger an arc flash event. Recommendations to reduce incident energy levels are provided where the incident energy is greater than 12 cal/cm^2; however, it is not always possible to achieve the desired incident energy levels due to equipment limitations and coordination requirements.

Incident energy levels above 40 cal/cm^2 represent a significant hazard and no PPE is available that can provide protection from such high incident energy levels. Greater emphasis should be put on ensuring that the equipment is de-energized and in an electrically safe condition prior to performing any work on this equipment.

This study has been conducted based on the current utility fault level and system configuration. Any change (increase or decrease) of the utility fault level or a change to the system configuration, protective device settings, or rating may increase the arc flash incident energy for each bus.

Arc flash studies typically evaluate the use of a maintenance mode switch as an efficient way to reduce high arc flash levels. Most of the time, the maintenance mode selector switch is in the "In Service" position. In this mode, the switch sends a signal to the relays to use one group of settings, which provides selective relay coordination where the downstream breakers would trip first and only a small part of the facility would lose power under the fault condition. The "Maintenance" position of the selector switch activates another group of the relay settings, which would trip the breaker in the shortest possible time to reduce the amount of the released arc flash energy. "Maintenance Mode" is active only for a short period of time while the energized equipment is accessed by maintenance personnel. While the relays are in "Maintenance Mode", good relay coordination is compromised for safety of the maintenance personnel.

3.6 Basis for Modeling

The plant's power system is modeled based on the following:

- The station is in its normal operating configuration.
- The loads are configured to replicate approximate typical loading at the site.
- The worker remains stationary during the arc flash incident and the working distance remains constant.
- When no protective device is found, the FCT will be set at 2 seconds.

3.7 Criteria for Protective Device Coordination

The purpose of coordination is to isolate faults selectively in the shortest time with minimal system shutdown. All protective devices between the load and the source of power must be set and sized to coordinate with each other to ensure that only the faulted area is disconnected from the circuit. Due to limitations of the protective devices, miscoordination can occur; however, miscoordination must be minimized without compromising equipment protection. The minimum CTI used for the protective device coordination analysis is based on IEEE Std. 242 Table 15-3.

This section of the study is to be interpreted in conjunction with the arc flash analysis. When possible, device coordination will be adjusted to reduce hazardous arc flash levels.

3.8 Results

Refer to Appendix 2 for protection coordination curves, relay, breakers, and fuse settings. Recommendations for improvement are included where appropriate in the appendices.

For the purpose of the Protection Coordination Study, Substation 1 and Substation 2 equipment is divided into branches. These branches were chosen to provide a view of the device coordination directly from the main distribution bus down to the end of the line loads. These branches effectively cover the entire scope of the plant, excluding ground fault protection at the low voltage equipment.

3.8.1 Substation 1 Study Results

The arc flash results for all scenarios are summarized in Appendix 2. The GE Multilin 850 Feeder Protection Relays on the BB-ESB1-MCC, BB-ESB2-MCC, and SUB1-PDC1A utilize dual settings groups. Group 1 settings are used for “Maintenance Mode” and Group 2 settings are used for “In Service Mode”. The highest arc flash incident energy at any specific MCC and bus is summarized in Appendix 2 and outlined in the sub-sections below.

3.8.1.1 Branch #1 – BB-SUB1 to BB-ESB1-MCC Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at the utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the BB-ESB1 Transformer are elevated.

Arc Flash Incident Energy	32 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.36 m

Arc flash levels at the BB-ESB1-MCC Line Side are elevated.

Arc Flash Incident Energy	35 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.55 m

Arc flash levels at the BB-ESB1-MCC are elevated.

Arc Flash Incident Energy	35 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.55 m

Arc Flash and Coordination Analysis

Refer to Branch #1- BB-ESB1-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service” mode relay settings at BB-ESB1-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second.

Arc flash levels are elevated at the BB-ESB1-MCC and BB-ESB1 Transformer. Work can be performed on the switchgear and transformer when “Maintenance Mode” settings are used at the BB-ESB1-MCC Line Feeder Relay.

The barrier between the BB-ESB1-MCC Main Breaker Line Side and the rest of the MCC is incomplete. In the case of an arc flash in the BB-ESB1-MCC Main Breaker enclosure, the same arc flash incident energy can propagate to the rest of the cells. Therefore, the maximum incident energy that can occur is reported.

Faults at the BB-ESB1-MCC loads, such as BB-ESB1-VFD11 at approximately 21.3 kA, are high enough to result in the BB-ESB1-MCC Main Breaker tripping due to miscoordination. The BB-ESB1-MCC Main Breaker is properly coordinated with the upstream BB-ESB1-MCC Line Feeder Relay.

The discrimination time at approximately 15.8 kA arcing fault is ~0.4 seconds between the BB-ESB1-MCC Main Breaker and the BB-ESB1-MCC Line Feeder Relay. BB-ESB1-MCC Line Feeder Relay and the SUB1 Feeder Relay are coordinated. The discrimination time at approximately 1.8 kA arcing fault at SUB1-PDC1 is ~0.2 seconds between the BB-ESB1-MCC Line Feeder Relay and the SUB1 Feeder Relay.

3.8.1.2 Branch #2 – BB-SUB1 to BB-ESB2-MCC (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the BB-ESB2 Transformer are elevated.

Arc Flash Incident Energy	32 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.4 m

Arc flash levels at the BB-ESB2-MCC Line Side are elevated.

Arc Flash Incident Energy	35 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.59 m

Arc flash levels at the BB-ESB2-MCC are elevated.

Arc Flash Incident Energy	35 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.59 m

Arc Flash and Coordination Analysis

Refer to Branch #2 – BB-ESB2-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at BB-ESB2-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second.

Arc flash levels are elevated at the BB-ESB2-MCC and BB-ESB2 Transformer. Work can be performed on these switchgear and transformer when “Maintenance Mode” settings are used at the BB-ESB2-MCC Line Feeder Relay.

The barrier between the BB-ESB2-MCC Main Breaker Line Side and the rest of the MCC is incomplete. In the case of an arc flash in the BB-ESB2-MCC Main Breaker enclosure, the same arc flash incident energy can propagate to the rest of the cells. Therefore, the maximum incident energy that can occur is reported.

Faults at the BB-ESB2-MCC loads such as BB-ESB2-VFD12 at approximately 22.3 kA are high enough to result in the BB-ESB2-MCC Main Breaker tripping due to miscoordination. The BB-ESB2-MCC Main Breaker is properly coordinated with the upstream BB-ESB2-MCC Line Feeder Relay. The discrimination time at approximately 16.4 kA arcing fault is ~.036 seconds between the BB-ESB2-MCC Main Breaker and the BB-ESB2-MCC Line Feeder Relay. BB-ESB2-MCC Line Feeder Relay and the SUB1 Feeder Relay are coordinated. The discrimination time at approximately 1.8 kA arcing fault is ~0.2 seconds between the BB-ESB2-MCC Line Feeder Relay and the SUB1 Feeder Relay.

3.8.1.3 Branch #3 – BB-SUB1 to MCC-AX Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.53 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.40 m

Arc flash levels at the TX-A Transformer are elevated.

Arc Flash Incident Energy	35.96 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.62 m

Arc flash levels at the MCC- A Main Breaker Line Side are elevated.

Arc Flash Incident Energy	39 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.82 m

Arc flash levels at MCC-A are elevated.

Arc Flash Incident Energy	39 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.82 m

Arc flash levels at MCC- AX are within a workable range.

Arc Flash Incident Energy	0.39 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.23 m

Arc flash levels at the CDP Panel BX are within a workable range.

Arc Flash Incident Energy	0.32 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.20 m

Arc Flash and Coordination Analysis

Refer to Branch #3-MCC-AX IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service” mode relay settings at SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second.

Arc flash levels are within workable range at the Main Service Switchgear, MCC AX, and CDP Panel BX. However, the arc flash level at the MCC-A and TX-A Transformer is elevated. Work can be performed on the switchgear and transformer when “Maintenance Mode” settings are used at the SUB1-PDC1A Feeder Relay.

The barrier between the MCC-A Main Breaker Line Side and the rest of the MCC is incomplete. In the case of an arc flash in the MCC-A Main Breaker enclosure, the same arc flash incident energy can propagate to the rest of the cells. Therefore, the maximum incident energy that can occur is reported.

Faults at the CDP Panel BX loads such as Panel PDP#1 at approximately 6.7 kA are high enough to result in the existing CDP BX breaker tripping due to miscoordination. Also, faults at existing MCC-AX at approximately 11 kA are high enough to result in the existing ATS feeder breaker tripping due to miscoordination. The SW-A disconnect fuse is also miscoordinated with the MCC-A Main Breaker due the high fault currents at approximately 12.6 kA. The SUB1-PDC1A relay is properly coordinated with the SUB1 Feeder Relay. The discrimination time at approximately 1.8 kA arcing fault is ~0.4 seconds between the SUB1-PDC1A relay and the SUB1 Feeder Relay.

3.8.1.4 Branch #4 – BB-SUB1 to MCC-B Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.53 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.40 m

Arc flash levels at the TX-B Transformer are elevated.

Arc Flash Incident Energy	35.79 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.61 m

Arc flash levels at the MCC- B Main Breaker Line Side are elevated.

Arc Flash Incident Energy	39 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.8 m

Arc flash levels at MCC- B are elevated.

Arc Flash Incident Energy	39 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	3.8 m

Arc Flash and Coordination Analysis

Refer to Branch #4 – MCC – B IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at the SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second.

Arc flash levels are within workable range at the Main Service Switchgear. The arc flash level at MCC-B and Transformer TX-B is elevated. Work can be performed on the switchgear and transformer when “Maintenance Mode” settings are used at the SUB1-PDC1A Feeder Relay.

The barrier between the MCC-B Main Breaker Line Side and the rest of the MCC is incomplete. In the case of an arc flash in the MCC-B Main Breaker enclosure, the same arc flash incident energy can propagate to the rest of the cells. Therefore, the maximum incident energy that can occur is reported.

Faults at the MCC-B loads such as Panel Pump #4 at approximately 12.5 kA are high enough to result in the existing MCC-B Main Breaker tripping due to miscoordination. The existing SW-B disconnect fuse is coordinated with MCC-B Main Breaker and the discrimination time is about 0.2 seconds. The SUB1-PDC1A relay is properly coordinated with the SUB1 Feeder Relay. The discrimination time at approximately 1.8 kA arcing fault is ~0.4 seconds between the SUB1-PDC1A relay and the SUB1 Feeder Relay.

3.8.1.5 Branch #5 – BB-SUB1 to MCC-E (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.53 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.40 m

Arc flash levels at the TX-E Transformer are elevated.

Arc Flash Incident Energy	16.71 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	2.27 m

Arc flash levels at the MCC- E Main Breaker Line Side are elevated.

Arc Flash Incident Energy	18 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	2.36 m

Arc flash levels at MCC- E are elevated.

Arc Flash Incident Energy	18 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	2.36 m

Arc flash levels at the PLM Shop MCC are within workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.20 m

Arc Flash and Coordination Analysis

Refer to Branch #5 – MCC-E IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at the SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. Also, arc flash levels are within workable range at the Main Service Switchgear and PLM Shop MCC. However, the arc flash level at the MCC-E and TX-E Transformer is elevated. Work can be performed on the switchgear and transformer when “Maintenance Mode” settings are used at the SUB1-PDC1A Feeder Relay.

The barrier between the MCC-E Main Breaker Line Side and the rest of the MCC is incomplete. In the case of an arc flash in the MCC-E Main Breaker enclosure, the same arc flash incident energy can propagate to the rest of the cells. Therefore, the maximum incident energy that can occur is reported.

Faults at the PLM Shop MCC loads such as the Air Compressor at approximately 7.7 kA are high enough to result in the existing PLM Shop Breaker and MCC-E Main Breaker tripping due to miscoordination. The existing MCC-E Main Breaker and upstream Fuse Disconnect SW-E are coordinated and the discrimination time is ~0.2 seconds. The SUB1-PDC1A relay is properly coordinated with the SUB1 Feeder Relay. SUB1-PDC1A relay and the SUB1 Feeder Relay are miscoordinated. The discrimination time at approximately 1.8 kA arcing fault is ~0.4 seconds between the SUB1-PDC1A relay and the SUB1 Feeder Relay.

3.8.1.6 Branch #6 – SUB1 to 5 kV Switchgear (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.53 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.40 m

Arc flash levels at the TX-F Transformer are within a workable range.

Arc Flash Incident Energy	0.67 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.5 m

Arc flash levels at the 5 kV Switchgear are within a workable range.

Arc Flash Incident Energy	0.67 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.5 m

Arc Flash and Coordination Analysis

Refer to Branch #6-5 kV SWGR IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at the SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the Main Service Switchgear, TX-F Transformer, and 5 kV Switchgear.

The JFBP#1 fuse is properly coordinated with the upstream SW-F fuse. The time discrimination time at approximately 2.1 kA arcing fault is ~0.2 seconds between the JFBP#1 fuse and the SW-F fuse. The SW-F Fuse and upstream Relay SUB1-PDC1A are miscoordinated.

The SUB1-PDC1A relay is properly coordinated with the SUB1 Feeder Relay. The discrimination time at approximately 1.8 kA arcing fault is ~0.4 seconds between the SUB1-PDC1A relay and the SUB1 Feeder Relay.

3.8.1.7 Branch #7 – BB-SUB1 to BB-ESB1-MCC Bus (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.96 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the BB-ESB1 Transformer are within a workable range.

Arc Flash Incident Energy	5.3 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.13 m

Arc flash levels at the BB-ESB1-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	4.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.08 m

Arc flash levels at BB-ESB1-MCC are within a workable range.

Arc Flash Incident Energy	4.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.08 m

Arc Flash and Coordination Analysis

Refer to Branch #7 – BB-ESB1-MCC MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using “Maintenance Mode” relay settings at the BB-ESB1-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also arc flash levels are within a workable range at the BB-ESB1-MCC Main Breaker Line Side and BB-ESB1 Transformer.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at the main buses, the instantaneous settings of BB-ESB1-MCC Line Feeder Protection Relay is enabled. The use of the Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.1.8 Branch #8 – BB-SUB1 to BB-ESB2-MCC Bus (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.96 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the BB-ESB2 Transformer are within a workable range.

Arc Flash Incident Energy	5.5 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.16 m

Arc flash levels at the BB-ESB2-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	5.1 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.11 m

Arc flash levels at BB-ESB2-MCC are within a workable range.

Arc Flash Incident Energy	5.1 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.11 m

Arc Flash and Coordination Analysis

Refer to Branch #8 – BB-ESB2-MCC MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using "Maintenance Mode" relay settings at BB-ESB2-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the BB-ESB2-MCC Main Breaker Line Side and BB-ESB2 Transformer.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at the main buses, the instantaneous settings of BB-ESB2-MCC Line Feeder Protection Relay is enabled. The use of Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.1.9 Branch #9 – BB-SUB1 to MCC-AX Bus (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.96 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.22 m

Arc flash levels at the TX-A Transformer are within a workable range.

Arc Flash Incident Energy	3.56 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.89 m

Arc flash levels at the MCC-A Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	3.4 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.85 m

Arc flash levels at MCC-A are within a workable range.

Arc Flash Incident Energy	3.4 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.85 m

Arc flash levels at MCC- AX are within a workable range.

Arc Flash Incident Energy	0.40 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.23 m

Arc flash levels at CDP Panel BX are within a workable range.

Arc Flash Incident Energy	0.32 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.20 m

Arc Flash and Coordination Analysis

Refer to Branch #9 – MCC-AX MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using “Maintenance Mode” relay settings at SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the Main Service Switchgear, MCC AX, CDP Panel BX, and MCC-A Main Breaker Line Side.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at the main buses, the instantaneous settings of SUB1-PDC1A Line Feeder Protection Relay is enabled. The use of the Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.1.10 Branch #10 – BB-SUB1 to MCC-B Bus (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.96 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the TX-B Transformer are within a workable range.

Arc Flash Incident Energy	3.38 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.86 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.22 m

Arc flash levels at the MCC- B Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	3.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.83 m

Arc flash levels at MCC- B are within a workable range.

Arc Flash Incident Energy	3.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.83 m

Arc Flash and Coordination Analysis

Refer to Branch #10 – MCC-B MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using “Maintenance Mode” relay settings at SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the Main Service Switchgear, MCC-B Main Breaker Line Side, and at MCC-B.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at the main buses, the instantaneous settings of SUB1-PDC1A Line Feeder Protection Relay is enabled. The use of Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.1.11 Branch #11 – BB-SUB1 to MCC-E (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.96 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.22 m

Arc flash levels at the TX-E Transformer are within a workable range.

Arc Flash Incident Energy	2.05 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.63 m

Arc flash levels at the MCC-E Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	1.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.61 m

Arc flash levels at MCC-E are within a workable range.

Arc Flash Incident Energy	1.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.61 m

Arc flash levels at PLM Shop MCC are within workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.19 m

Arc Flash and Coordination Analysis

Refer to Branch #11-MCC-E MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using “Maintenance Mode” relay settings at SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the Main Service Switchgear, PLM Shop MCC, MCC-E Main Breaker Line Side, and at MCC-E.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at the main buses, the instantaneous settings of SUB1-PDC1A Line Feeder Protection Relay is enabled. The use of Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.1.12 Branch #12 – BB-SUB1 to 5 kV Switchgear (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB1 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	6.6 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	5.26 m

Arc flash levels at the SUB1 Transformer are within workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.96 m

Arc flash levels at the SUB1-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	2.5 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.98 m

Arc flash levels at the Main Service Switchgear are within a workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.22 m

Arc flash levels at the TX-F Transformer are within a workable range.

Arc Flash Incident Energy	0.25 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.18 m

Arc flash levels at the 5 kV Switchgear Bus are within a workable range.

Arc Flash Incident Energy	0.25 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	0.18 m

Arc Flash and Coordination Analysis

Refer to Branch #12-5 kV SWGR MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using “Maintenance Mode” relay settings at SUB1-PDC1A Feeder Relay.

Arc flash levels are within a workable range at the SUB1 12.5 kV Switch and SUB1-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the Main Service Switchgear and 5 kV Switchgear.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at other main buses, the instantaneous settings of SUB1-PDC1A Line Feeder Protection Relay is enabled. The use of Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.1.13 Other Buses not included in Branches 1-6 (Group 2 In Service Mode Settings)

All other buses not included in above mentioned Branches 1 to 6, have the arc flash levels within workable range. Refer to the arc flash tables in Appendix 2.

3.8.1.14 Branch # 13 SUB1-PDC1 Ground Fault Results

There is no arc flash analysis related to the ground fault relay branch as the three phase calculations provide worst case arc flash values.

3.8.1.15 Branch # 14 BB-ESB1-MCC Ground Fault Results

There is no arc flash analysis related to the ground fault relay branch, as the three phase calculations provide worst case arc flash values.

3.8.1.16 Branch # 15 BB-ESB2-MCC Ground Fault Results

There is no arc flash analysis related to the ground fault relay branch, as the three phase calculations provide worst case arc flash values.

3.8.2 Substation 2 Study Results

The arc flash results for all scenarios are summarized in Appendix 2. The GE Multilin 850 Feeder Protection Relays on Lines BB-ESB3-MCC, BB-ESB4-MCC, BB-ESB5-MCC, MCC LC-3, and MCC LC-4 utilize dual settings groups. Group 1 settings are used for “Maintenance Mode” and Group 2 settings are used for “In Service Mode”. The highest arc flash incident energy at any specific MCC and bus is summarized in Appendix 2 and outlined in the sub-sections below.

3.8.2.1 Branch #1 – BB-SUB 2 to BB-ESB3A-MCC Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB2 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	5.4 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	4.27 m

Arc flash levels at the SUB2 Transformer are within workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.02 m

Arc flash levels at the SUB2-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.03 m

Arc flash levels at the BB-ESB3-MCC Main Breaker Line Side are elevated.

Arc Flash Incident Energy	13 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.98 m

Arc flash levels at the BB-ESB3-MCC are elevated.

Arc Flash Incident Energy	13 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.98 m

Arc flash levels at the BB-ESB3A-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.2 m

Arc flash levels at the BB-ESB3A-MCC are within a workable range.

Arc Flash Incident Energy	0.3 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.2 m

Arc Flash and Coordination Analysis

Refer to Branch #1 – BB-ESB3A-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at BB-ESB3-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB2 12.5 kV Switch and SUB2-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at BB-ESB3-MCC and BB-ESB3A-MCC.

Faults at the BB-ESB3A-MCC loads such as BB-ESB3A-VFD2 at approximately 6.19 kA are high enough to result in the BB-ESB3A-MCC Main Breaker, BB-ESB3A-MCC Line Breaker and ESB3-MCC Main Breaker tripping due to miscoordination. The BB-ESB3-MCC Line Relay is properly coordinated with the SUB2 Feeder Relay but it is miscoordinated with the SUB2 Xmer Primary Relay. The discrimination time at approximately 1.9 kA arcing fault is ~3.1 seconds between the BB-ESB3-MCC Line Relay and the SUB2 Feeder Relay.

3.8.2.2 Branch #2 – SUB 2 to BB-ESB4-MCC Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Refer to Appendix 2 for the arc flash results.

Arc flash levels at the SUB2 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	5.4 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	4.27 m

Arc flash levels at the SUB2 Transformer are within workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.02 m

Arc flash levels at the SUB2-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.03 m

Arc flash levels at the BB-ESB4-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	5.5 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.15 m

Arc flash levels at the BB-ESB4-MCC are within a workable range.

Arc Flash Incident Energy	5.5 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.15 m

Arc Flash and Coordination Analysis

Refer to Branch #2 – BB-ESB4-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at BB-ESB4-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB2 12.5 kV Switch and SUB2-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the BB-ESB4-MCC.

The BB-ESB4-MCC Main Breaker is properly coordinated with the BB-ESB4-MCC Line Relay. The discrimination time at approximately 1.4 kA arcing fault is ~1 seconds between the BB-ESB4-MCC Main Breaker and the BB-ESB4-MCC Line Relay.

The BB-ESB4-MCC Line Relay is properly coordinated with the SUB2 Feeder. The discrimination time at approximately 1.9 kA arcing fault is ~4 seconds between the BB-ESB4-MCC Line Relay and the SUB2 Feeder Relay.

3.8.2.3 Branch #3 – BB-SUB 2 to BB-ESB5C-MCC (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB2 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	5.4 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	4.27 m

Arc flash levels at the SUB2 Transformer are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.02 m

Arc flash levels at the SUB2-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.03 m

Arc flash levels at the BB-ESB5-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	7.8 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.43 m

Arc flash levels at BB-ESB5-MCC are within a workable range.

Arc Flash Incident Energy	7.8 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.43 m

Arc flash levels at the BB-ESB5C-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	0.18 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.14 m

Arc flash levels at BB-ESB5C-MCC are within a workable range.

Arc Flash Incident Energy	0.18 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.14 m

Arc Flash and Coordination Analysis

Refer to Branch #3 – BB-ESB5C-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at BB-ESB5-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB2 12.5 kV Switch and SUB2-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the BB-ESB5C-MCC and BB-ESB5-MCC.

Faults at the BB-ESB5C-MCC loads such as BB-ESB5A-VFD1 at approximately 5.5 kA are high enough to result in the BB-ESB5C-MCC Main Breaker, ESB5C-MCC Line Breaker and ESB5-MCC Main Breaker tripping due to miscoordination. The BB-ESB5-MCC Line Relay is properly coordinated with the SUB2 Feeder Relay. The discrimination time at approximately 1.9 kA arcing fault is ~2.7 seconds between the BB-ESB5-MCC Line Relay and the SUB2 Feeder Relay

3.8.2.4 Branch #4 – BB-SUB 2 to BB-LC3A-MCC Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB2 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	5.4 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	4.27 m

Arc flash levels at the SUB2 Transformer are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.02 m

Arc flash levels at the SUB2-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.03 m

Arc flash levels at the T-3 Transformer are within a workable range.

Arc Flash Incident Energy	8.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.54 m

Arc flash levels at the MCC LC3 Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	8.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.54 m

Arc flash levels at MCC LC-3 are within a workable range.

Arc Flash Incident Energy	8.9 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.55 m

Arc flash levels at the BB-LC3A-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	0.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.15 m

Arc flash levels at BB-LC3A-MCC are within a workable range.

Arc Flash Incident Energy	0.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.15 m

Arc Flash and Coordination Analysis

Refer to Branch #4 – BB-LC3A-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at LC3-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB2 12.5 kV Switch and SUB2-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at BB-LC3A-MCC. The arc flash level at the MCC LC-3 Main Breaker Line Side and T-3 Transformer are within workable range.

Faults at the BB-LC3A-MCC loads such as BB-LC3A-VFD1 at approximately 6.8 kA are high enough to result in the LC3A-MCC Main Breaker tripping due to miscoordination. The upstream MCC-LC-3 Main Breaker and LC3-MCC Line Breaker are also miscoordinated with LC3A-MCC Main Breaker due to the high fault currents at approximately 7.8 kA. The LC3-MCC Line Relay is properly coordinated with the SUB2 Feeder Relay. The discrimination time at approximately 1.9 kA arcing fault is ~3.7 seconds between the LC3-MCC Line Relay and the SUB2 Feeder Relay.

3.8.2.5 Branch #5 – SUB 2 to BB-LC4A-MCC Bus (Group 2 In Service Mode Settings)

Arc Flash Results

Arc flash levels at the SUB2 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	5.4 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	4.27 m

Arc flash levels at the SUB2 Transformer are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.02 m

Arc flash levels at the SUB2-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.03 m

Arc flash levels at the T-4 Transformer are within a workable range.

Arc Flash Incident Energy	9.1 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.57 m

Arc flash levels at the MCC LC4 Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	9.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.58 m

Arc flash levels at MCC LC-4 are within a workable range.

Arc Flash Incident Energy	9.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	1.58 m

Arc flash levels at the BB-LC4A-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	0.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.15 m

Arc flash levels at BB-LC4A-MCC are within a workable range.

Arc Flash Incident Energy	0.2 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.15 m

Arc Flash and Coordination Analysis

Refer to Branch #5 –BB-LC4A-MCC IN-SVC TCC Curve in Appendix 2. This TCC shows protective device coordination when using “In Service Mode” relay settings at LC4-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB2 12.5 kV Switch and SUB2-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at the BB-LC4A-MCC. The arc flash level at MCC LC-4 Main Breaker Line Side and T-4 Transformer are within workable range.

Faults at the BB-LC4A-MCC loads, such as BB-LC4A-VFD1 at approximately 5.8 kA, are high enough to result in the LC4A-MCC Main Breaker tripping due to miscoordination. The upstream MCC-LC-4 Main Breaker and LC4-MCC Line Breaker are also miscoordinated with the LC4A-MCC Main Breaker due the high fault currents at approximately 7.6 kA. The LC4-MCC Line Relay is properly coordinated with the SUB2 Feeder Relay, but it is miscoordinated with the SUB2 Xmer Primary Relay. The discrimination time at approximately 1.9 kA arcing fault is ~3.7 seconds between the LC4-MCC Line Relay and the SUB2 Feeder Relay.

3.8.2.6 Branch #6 – BB-SUB 2 to BB-ESB3A-MCC Bus (Group 1 Maintenance Mode Settings)

Arc Flash Results

Arc flash levels at the SUB2 12.5 kV Switch are within a workable range. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV Switch. The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown and not controlled by Trans Mountain, the actual trip time may be longer than 2 seconds.

Arc Flash Incident Energy	5.4 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	4.27 m

Arc flash levels at the SUB2 Transformer are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.02 m

Arc flash levels at the SUB2-PDC1 Bus are within a workable range.

Arc Flash Incident Energy	1.3 cal/cm^2
Working Distance	0.91 m
Flash Protection Boundary	1.03 m

Arc flash levels at the BB-ESB3-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	1.7 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.56 m

Arc flash levels at BB-ESB3-MCC are within a workable range.

Arc Flash Incident Energy	1.7 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.56 m

Arc flash levels at the BB-ESB3A-MCC Main Breaker Line Side are within a workable range.

Arc Flash Incident Energy	0.28 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.19 m

Arc flash levels at BB-ESB3A-MCC are within a workable range.

Arc Flash Incident Energy	0.28 cal/cm^2
Working Distance	0.45 m
Flash Protection Boundary	0.19 m

Arc Flash and Coordination Analysis

Refer to Branch #6 – BB-ESB3A-MCC MAINT TCC Curve in Appendix 2. This TCC shows protective device coordination when using “Maintenance Mode” relay settings at BB-ESB3-MCC Line Feeder Relay.

Arc flash levels are within a workable range at the SUB2 12.5 kV Switch and SUB2-PDC1 Bus. There are no upstream Trans Mountain owned protective devices to clear the fault upstream of the 12.5 kV switch. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 second. Also, arc flash levels are within workable range at BB-ESB3-MCC and BB-ESB3A-MCC.

Since it is desirable that the faults be cleared as soon as possible in Maintenance Mode and to keep the arc flash levels low at the main buses, the instantaneous settings of the BB-ESB3-MCC Line Feeder Protection Relay is enabled. The use of Maintenance Mode Switch leads to miscoordination of protective devices, which is present only at times when Maintenance Mode is activated.

3.8.2.7 Other Buses not included in Branches 1-5 (Group 2 In Service Mode Settings)

All other buses not included in the above mentioned Branches 1 to 5 have the arc flash levels within workable Range. Refer to arc flash tables in Appendix 2.

3.8.2.8 Branch # 7 SUB2-PDC1 Ground Fault Results

There is no arc flash analysis related to the ground fault relay branch, as the three phase calculations provide worst case arc flash values.

4.0 ALTERNATE SCENARIO – EMERGENCY GENERATOR

4.1 Introduction

Results and analysis for the emergency generator scenario have been provided for the system. In the event of a loss of utility power, an emergency generator restores power to a limited number of 600 V and 480 V MCCs, but medium voltage loads such as the jet fuel pumps will not run.

There are five (5) Generators at sites. The largest Generator has a 150 kW rating.

4.2 Short Circuit Results Summary

All protective devices, 600 V buses and 480 V buses, are adequately rated for the calculated short circuit currents. The detailed tabulated results are provided in Appendix 3.

4.3 Arc Flash Results

Arc flash levels at all of the operating buses are below 7 cal/cm^2, which is an acceptable level.

5.0 RECOMMENDATIONS AND RELAY SETTINGS

During the process of the coordination and arc flash study, design improvements were identified. The following recommended design improvements are different then the provided design shown on the single lines in Appendix 4. The study model single lines in Appendix 2 show the recommended design with improved coordination and reduced arc flash levels. The studies were completed assuming the following recommendations have been followed:

- Replace BC Hydro Shellmont 50-100:5 CTs for feeder breaker relay and transformer relay with 150-300:5 CTs.
- Replace zero sequence CTs on Feeder Lines SUB1-PDC1A, BB-ESB1-MCC, BB-ESB2-MCC, MCC-LC3, MCC-LC4, BB-ESB3-MCC, BB-ESB4-MCC, and BB-ESB5-MCC at Substation 1 and 2 with 50/5 CTs.
- A multifunction generator protection relay similar to Multilin 889 is not required for small emergency generators. Low voltage breaker at the generators is adequate for protection.
- 4160 V/600 V and 12470 V/600 V power distribution transformers are recommended to be solidly grounded and ground faults cleared by breakers. As a worst case scenario, tripping of the breakers is calculated against the arcing current, which is substantially lower than the bolted fault current. This approach ensures that any arcing currents, which may be developed in the low voltage system, are quickly cleared by the breakers.
- It is recommended to add new relays and other equipment to improve the low voltage coordination. Details of the design will require another design study to determine a practical solution.

Directional Overcurrent Relay (ANSI Function 67) is used in this project to block the stored energy of running motors from feeding an electrical fault upstream of the motor protection relays. Directional relays are used with overcurrent relays to operate when the fault current is flowing from each 300 HP motor towards the system. For this application, an element characteristic angle of 30° with polarizing voltage threshold of 0.7 was selected. The instantaneous overcurrent pickup of 110 A was selected for the directional relay.

Directional Power Relay (ANSI Function 32) is used in this project to block the stored energy of running motors from feeding an electrical fault upstream of the motor protection relays. For this application, a minimum operating power of 20 % and a relay characteristic angle of 85° was selected.

5.1 Substation 1 Relays

The overcurrent protection settings at the Substation 1 equipment are as follows:

SUB 1 Feeder Relay GE Multilin 850 50/51 Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.61

SUB 1 Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Ground Time Overcurrent Pickup	0.05
Ground Time Overcurrent Curve Type	Definite Time
Ground Time Overcurrent Multiplier	0.5

SUB 1 Transformer Relay GE Multilin 845 50/51 Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Moderately Inverse
Phase Time Overcurrent Multiplier	1.1

SUB 1 Transformer Relay GE Multilin 845 50G/51G Function (Group 1 and 2)	
Ground Time Overcurrent Pickup	4
Ground Time Overcurrent Curve Type	Definite Time
Ground Time Overcurrent Multiplier	0.42

SUB 1-PDC1A Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.32
Phase Instantaneous Pickup	1
Phase Instantaneous Overcurrent Delay	0

SUB 1-PDC1A Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.32

SUB 1-PDC1A Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

BB-ESB1-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.7
Phase Instantaneous Pickup	4
Phase Instantaneous Overcurrent Delay	0

BB-ESB1-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.7

BB-ESB1-MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

ESB1-MCC Main Feeder Relay GE Multilin 850 50/51 Function (Group 1 and 2)	
Phase Long Time Pickup	1
Phase Long Time Delay	60
Phase Short Time Pickup	10
Phase Short Time Delay	0.1
Phase Instantaneous Overcurrent Delay	4
Ground Fault Pickup	250 A
Ground Fault Delay	0.2

BB-ESB2-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.7
Phase Instantaneous Pickup	4
Phase Instantaneous Overcurrent Delay	0

BB-ESB2-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.7

BB-ESB2-MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

ESB2-MCC Main Feeder Relay GE Multilin 850 50/51 Function (Group 1 and 2)	
Phase Long Time Pickup	1
Phase Long Time Delay	60
Phase Short Time Pickup	10
Phase Short Time Delay	0.1
Phase Instantaneous Overcurrent Delay	4
Ground Fault Pickup	250 A
Ground Fault Delay	0.2

5.2 Substation 2 Relays

The overcurrent protection settings at the Substation 2 are as follows:

SUB 2 Feeder Relay GE Multilin 850 50/51 Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.63

SUB 2 Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Ground Time Overcurrent Pickup	0.05
Ground Time Overcurrent Curve Type	Definite Time
Ground Time Overcurrent Multiplier	0.5

SUB 2 Transformer Relay GE Multilin 845 50/51 Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Moderately Inverse
Phase Time Overcurrent Multiplier	0.12

SUB 2 Transformer Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Ground Time Overcurrent Pickup	4
Ground Time Overcurrent Curve Type	Definite Time
Ground Time Overcurrent Multiplier	0.4

LC-3 MCC Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.49
Phase Instantaneous Pickup	5
Phase Instantaneous Overcurrent Delay	0

LC-3 MCC Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.49

LC-3 MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

LC-4 MCC Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.5
Phase Instantaneous Pickup	4
Phase Instantaneous Overcurrent Delay	0

LC-4 MCC Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.5

LC-4 MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

BB-ESB3-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	1.01
Phase Instantaneous Pickup	5
Phase Instantaneous Overcurrent Delay	0

BB-ESB3-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	1.01

BB-ESB3-MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

BB-ESB4-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.16

BB-ESB4-MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

BB-ESB5-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 1)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.5
Phase Instantaneous Pickup	4
Phase Instantaneous Overcurrent Delay	0

BB-ESB5-MCC Line Feeder Relay GE Multilin 850 50/51 Function (Group 2)	
Phase Time Overcurrent Pickup	1
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.5

BB-ESB5-MCC Line Feeder Relay GE Multilin 850 50G/51G Function (Group 1 and 2)	
Phase Time Overcurrent Pickup	0.05
Phase Time Overcurrent Curve Type	Extremely Inverse
Phase Time Overcurrent Multiplier	0.2

6.0 CONCLUSION

This Power System Study evaluated the TMEP Burnaby Terminal power distribution system. The future terminal equipment was evaluated for short circuit currents and for arc flash incident energy and protective device coordination. As not all data was available at the time of this analysis, this study will be re-examined once detailed design is complete and all information is available.

All buses at Burnaby Terminal (switchgears and MCCs) were found to be operating within their rated short circuit withstand capability. Additionally, all protective devices were found to be operating within their rated short circuit interrupting capabilities.

The study results are based on a maximum FCT of 2 seconds in accordance with IEEE 1584 recommendation. Since the upstream protective device at utility is unknown, the actual trip time may be longer than 2 seconds.

Arc flash levels at BB-ESB1-MCC and BB-ESB1-TXR1 transformer are elevated during normal operations. The BB-ESB1-MCC Line Feeder Relay is equipped with a Maintenance Mode Switch that must be used to reduce arc flash levels to an acceptable level during maintenance activities at BB-ESB1-MCC or BB-ESB1-TXR1.

Arc flash levels at BB-ESB2-MCC and BB-ESB2-TXR1 transformer are elevated during normal operations. The BB-ESB2-MCC Line Feeder Relay is equipped with a Maintenance Mode Switch that must be used to reduce arc flash levels to an acceptable level during maintenance activities at BB-ESB2-MCC or BB-ESB2-TXR1.

Arc flash levels at MCC-A Line Side are elevated during normal operations. The SUB1-PDC1A Line Feeder Relay is equipped with a Maintenance Mode Switch that must be used to reduce arc flash levels to an acceptable level during maintenance activities at MCC-A.

Arc flash levels at MCC-B are elevated during normal operations. The SUB1-PDC1A Line Feeder Relay is equipped with a Maintenance Mode Switch that must be used to reduce arc flash levels to an acceptable level during maintenance activities at MCC-B.

Arc flash levels at MCC-E are elevated during normal operations. The SUB1-PDC1A Line Feeder Relay is equipped with a Maintenance Mode Switch that must be used to reduce arc flash levels to an acceptable level during maintenance activities at MCC-E.

Arc flash levels at ESB3-MCC are elevated during normal operations. The BB-ESB3-MCC Line Feeder Relay is equipped with a Maintenance Mode Switch that must be used to reduce arc flash levels to an acceptable level during maintenance activities at BB-ESB3-MCC.

All other equipment at Burnaby Terminal have acceptable arc flash levels.

Appendix 1
Short Circuit Analysis

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Table 1B - High Voltage and Medium Voltage Disconnect Switch

Disconnect Switches	Momentary Rating (kA)	Momentary Fault Duty (kA)	% Capacity Utilized [%]
SUB1 12.5 kV Switch	40	4.1	10.25
SUB2 12.5 kV Switch	40	2.5	6.25

Table 1C - Medium Voltage Bus Rating

Bus	Lineup Bus Bracing (kA)	Momentary Fault Duty (kA)	% Capacity Utilized [%]
SUB1-PDC1	25	2.6	10
SUB2-PDC1	25	2.3	9
02-Main Service SWGR	25	2.6	10
5kV SWGR	25	3.5	14

Table 1D - Medium Voltage Fuse & Breaker Rating

Breaker	Momentary Rating (kA)	Momentary Fault Duty (kA)	Interrupting Rating (kA)	Sym Interrupting Duty (kA)	% Capacity Utilized [%]	Breaker Cycles
SUB 1 Breaker	26	4.1	16	3.1	19	3
SUB 2 Breaker	26	2.5	16	2.4	15	3
SUB1-PDC1A	37	2.6	18	1.7	9	3
BB-ESB1-MCC LINE Bkr	58	2.6	28	1.7	6	3
BB-ESB2-MCC LINE Bkr	58	2.6	28	1.7	6	3
LC3-MCC LINE Bkr	78	2.3	41	1.9	5	3
LC4-MCC LINE Bkr	78	2.3	41	1.9	5	3
BB-ESB3-MCC LINE Bkr	78	2.3	41	1.9	5	3
BB-ESB4-MCC LINE Bkr	78	2.3	41	1.9	5	3
BB-ESB5-MCC LINE Bkr	78	2.3	41	1.9	5	3
SW-A	22.4	2.6	14	2.0	14	n/a
SW-B	22.4	2.6	14	2.0	14	n/a
SW-E	22.4	2.6	14	2.0	14	n/a
SW-F	22.4	2.6	14	2.0	14	n/a
JFBP#1 FU	80	3.9	50	2.9	6	n/a
JFBP#2 FU	80	3.9	50	2.9	6	n/a

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Table 1E - Low Voltage MCC Bus Rating

Bus	Lineup Bus Bracing (kA)	Fault Duty (kA)	% Capacity Utilized [%]	Notes
BB-ESB1-MCC	42	22.4	53	
BB-ESB2-MCC	42	23.5	56	
BB-ESB2A-MCC	42	21.2	50	
MCC-A	42	14.3	34	
MCC-F	42	10.1	24	
CDP PANEL A	42	8.1	19	
CDP PANEL SB-A1	42	4.9	12	
MCC-B	42	13.6	32	
MCC-E	42	10	24	
PLM SHOP MCC	42	8.4	20	
MECH SHOP PANEL	42	8.4	20	
MCC-EX	42	1.2	3	
MCC-AX	42	12.6	30	
DIV. OFFICE BASMENT	42	1.8	4	
LEVEE BUILDING	42	0.9	2	
CDP PANEL AX (CTRL RM BLDG)	42	6.4	15	
CDP PANEL BX	42	7.5	18	
PDP#1	42	6.7	16	
PDP#3	42	6.7	16	
PDP#4	42	7.2	17	
PDP#5	42	7.2	17	
PDP#6	42	7.6	18	
MCC-DX	42	6.8	16	
MCC LC-3	42	7.9	19	
BB-LC3A-MCC	42	6.9	16	
TK90/88 MCC	42	4.9	12	
TK82 MCC	42	4.8	11	
TK86 MCC	42	3.7	9	
TK72 MCC	42	2.8	7	
TK74 MCC	42	2.7	6	
MCC LC-4	42	7.6	18	
BB-LC4A-MCC	42	6.7	16	
TK71 MCC	42	2.9	7	
TK73 MCC	42	2.8	7	
TK81 MCC	42	2.9	7	
TK83 MCC	42	3.9	9	
TK85 MCC	42	6.4	15	
TK87 MCC	42	2.8	7	
BB-ESB3-MCC	42	6.8	16	
BB-ESB3A-MCC	42	6.5	15	

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Table 1E - Low Voltage MCC Bus Rating (Cont.)

Bus	Lineup Bus Bracing (kA)	Fault Duty (kA)	% Capacity Utilized [%]	Notes
BB-ESB3B-MCC	42	6.5	15	
BB-ESB4-MCC	42	1.9	5	
BB-ESB5-MCC	42	6	14	
BB-ESB5A-MCC	42	5.5	13	
BB-ESB5B-MCC	42	5.5	13	
BB-ESB5C-MCC	42	5.5	13	

Table 1F - Low Voltage Breaker & Fuse Rating

Device	Interrupting Rating (kA)	Low Voltage Fault Duty (kA)	% Capacity Utilized [%]
ATS FDR BK	35	14.3	41
BB-ESB1-GEN Bkr	25	1.3	5
BB-ESB2-GEN Bkr	25	1.3	5
BB-ESB3-GEN Bkr	25	0.4	2
BB-ESB3A-MCC LINE Bkr	35	6.9	20
BB-ESB3A-MCC Main Bkr	35	6.5	19
BB-ESB3B-MCC LINE Bkr	35	6.9	20
BB-ESB3B-MCC Main Bkr	35	6.5	19
BB-ESB4-GEN Bkr	25	0.4	2
BB-ESB5-GEN Bkr	25	0.4	2
BM-74 Bkr	35	5.5	16
BM-75 Bkr	35	5.5	16
BM-76 Bkr	35	5.5	16
BM-77 Bkr	35	5.5	16
BM-78 Bkr	35	6.0	17
BM-79 Bkr	35	5.5	16
BM-80 Bkr	35	6.9	20
BM-91 Bkr	35	6.9	20
BM-93 Bkr	35	6.9	20
BM-96 Bkr	35	6.5	19
BM-97 Bkr	35	6.5	19
BM-98 Bkr	35	6.5	19
BPM-11 Bkr	35	22.4	64
BPM-12 Bkr	35	23.5	67
BPM-21 Bkr	35	22.4	64
BPM-22 Bkr	35	23.5	67
BPM-31 Bkr	35	22.4	64
BPM-31 Bkr1	35	6.7	19
BPM-32 Bkr	35	23.5	67
CDP A FDR BK	25	14.3	57
CDP SB-A1 FDR BK	25	14.3	57

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Table 1F - Low Voltage Breaker & Fuse Rating (Cont.)

Device	Interrupting Rating (kA)	Low Voltage Fault Duty (kA)	% Capacity Utilized [%]
CDP-AX FDR BK	65	12.6	19
CDP-BX FDR BK	65	12.6	19
DIV OFFICE FDR BK	65	12.6	19
ESB1-AHU Bkr	25	22.4	90
ESB1-LP1 Bkr	25	22.4	90
ESB1-MCC MAIN Bkr	65	22.4	34
ESB2-AHU Bkr	25	23.5	94
ESB2-LP1 Bkr	25	23.5	94
ESB2-MCC MAIN Bkr	65	23.5	36
ESB2A-LP1 Bkr	25	21.2	85
ESB2A-MCC LINE Bkr	25	23.5	94
ESB2A-MCC MAIN Bkr	25	21.2	85
ESB3-LP1 Bkr	25	6.9	28
ESB3-MCC MAIN Bkr	25	6.9	28
ESB3A-LP1 Bkr	25	6.5	26
ESB3B Bkr	35	6.5	19
ESB3B-LP1 Bkr	25	6.5	26
ESB4-LP1 Bkr	25	1.9	8
ESB4-MCC MAIN Bkr	35	1.9	5
ESB5-LP1 Bkr	25	6.0	24
ESB5-MCC MAIN Bkr	25	6.0	24
ESB5A-LP1 Bkr	25	5.5	22
ESB5A-MCC LINE Bkr	35	6.0	17
ESB5A-MCC MAIN Bkr	35	5.5	16
ESB5B-LP1 Bkr	25	5.5	22
ESB5B-MCC LINE Bkr	35	6.0	17
ESB5B-MCC MAIN Bkr	35	5.5	16
ESB5C-LP1 Bkr	25	5.5	22
ESB5C-MCC LINE Bkr	35	6.0	17
ESB5C-MCC MAIN Bkr	35	5.5	16
G-LC-3 BK	14	2.6	19
G-LC-4 BK	14	2.6	19
GEN BK	65	1.5	2
LC 71 FDR BK	14	9.2	66
LC 72 FDR BK	14	9.4	67
LC 73 FDR BK	65	8.5	13
LC 74 FDR BK	35	8.8	25
LC 81 FDR BK	14	9.2	66
LC 82 FDR BK	14	9.4	67
LC 83 FDR BK	14	9.2	66

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Table 1F - Low Voltage Breaker & Fuse Rating (Cont.)

Device	Interrupting Rating (kA)	Low Voltage Fault Duty (kA)	% Capacity Utilized [%]
LC 84 FDR BK	14	9.4	67
LC 85 FDR BK	14	9.2	66
LC 86 FDR BK	14	9.4	67
LC 87 FDR BK	14	9.2	66
LC 90/88 FDR BK	35	8.8	25
LC3A-LP1 Bkr	25	6.9	28
LC3A-MCC LINE Bkr	65	8.8	14
LC3A-MCC MAIN Bkr	65	6.9	11
LC4A-LP1 Bkr	25	6.7	27
LC4A-MCC LINE Bkr	65	8.5	13
LC4A-MCC MAIN Bkr	65	6.7	10
MCC-A MAIN	30	14.3	48
MCC-B MAIN	30	13.8	46
MCC-DX FDR BK	25	7.5	30
MCC-E MAIN	35	10.3	29
MCC-EX FDR BK	65	12.6	19
MCC-EX MAIN	65	1.2	2
MCC-LC-2 MAIN BK	65	0.0	0
MCC-LC-3 MAIN BK	30	8.9	30
MCC-LC-4 MAIN BK	30	8.6	29
MCCF FDR BK	35	14.3	41
MECH SHOP BKR	100	10.3	10
PDP1 FDR BK	25	7.5	30
PDP3/4 FDR BK	25	7.5	30
PDP5 FDR BK	25	7.5	30
PDP6 FDR BK	25	7.5	30
PFC FD BK	14	9.4	67
PFC-LC4 FD BK	14	9.2	66
PLM SHOP BKR	100	10.3	10
TK71 MAIN BK	14	2.9	21
TK72 MAIN BK	14	2.8	20
TK73 MAIN BK	65	2.8	4
TK74 MAIN BK	14	2.7	19
TK81 MAIN BK	14	2.9	21
TK82 MAIN BK	14	3.1	22
TK83 MAIN BK	14	3.9	28
TK84 MAIN BK	14	4.8	34
TK85 MAIN BK	14	6.5	46
TK86 MAIN BK	14	3.7	26
TK87 MAIN BK	65	2.8	4
TK90/88 MAIN BK	65	4.9	8

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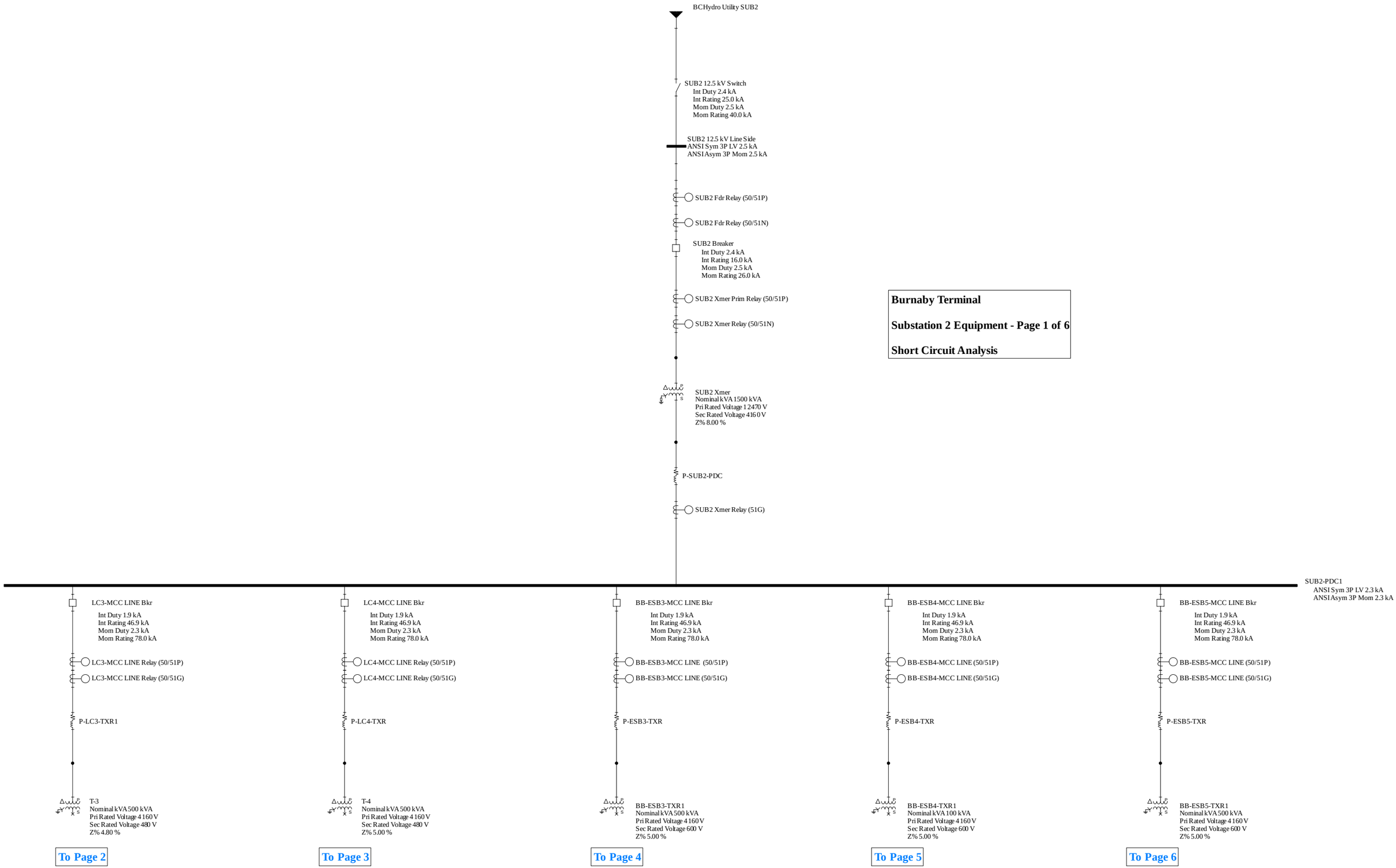
Table 1F - Load Interrupt/Transfer Switch

Switch	Interrupt Rating (kA)	Duty (kA)	% Capacity Utilized {Interrupting} [%]
ATS-NORM	30	12.2	41
BB-ESB1-TRS	30	23.2	77
BB-ESB2-TRS	30	24.2	81
ATS-LC3	30	7.9	26
ATS-LC4	30	7.6	25
BB-ESB3-TRS	30	6.9	23
BB-ESB4-TRS	30	2	7
BB-ESB5-TRS	30	6.3	21


BCHydro Utility SUB2
SUB2 12.5 kV Switch
Int Duty 2.4 kA
Int Rating 25.0 kA
Mom Duty 2.5 kA
Mom Rating 40.0 kA
SUB2 12.5 kV Line Side
ANSI Sym 3P LV 2.5 kA
ANSI Asym 3P Mom 2.5 kA
SUB2 Fdr Relay (50/51P)
SUB2 Fdr Relay (50/51N)
SUB2 Breaker
Int Duty 2.4 kA
Int Rating 16.0 kA
Mom Duty 2.5 kA
Mom Rating 26.0 kA
SUB2 Xmer Prim Relay (50/51P)
SUB2 Xmer Relay (50/51N)
SUB2 Xmer
Nominal kVA 1500 kVA
Pri Rated Voltage 12470 V
Sec Rated Voltage 4160 V
Z% 8.00 %
P-SUB2-PDC
SUB2 Xmer Relay (51G)
Burnaby Terminal
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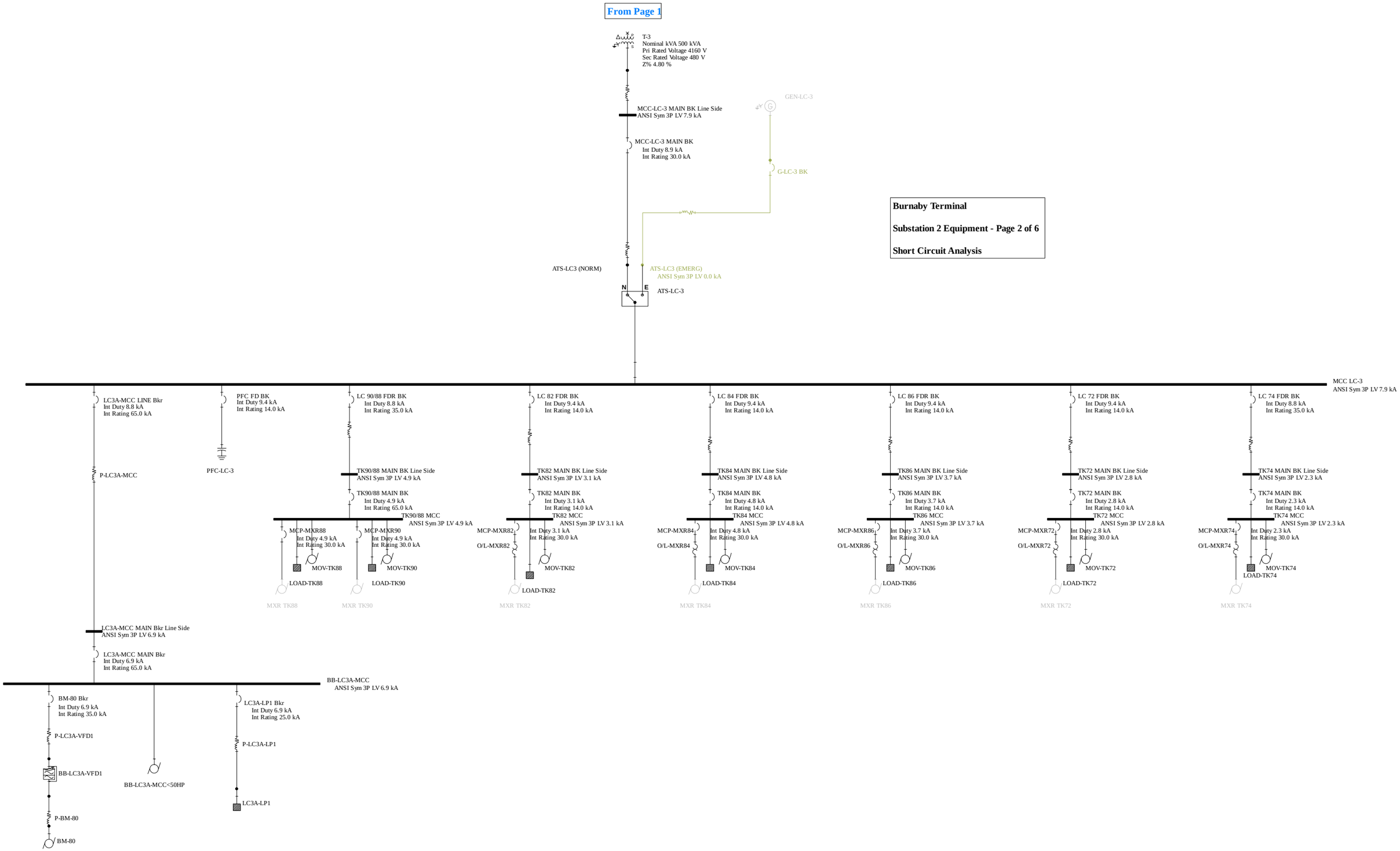
Short Circuit Analysis
SUB2-PDC1
ANSI Sym 3P LV 2.3 kA
ANSI Asym 3P Mom 2.3 kA
LC3-MCC LINE Bkr
Int Duty 1.9 kA
Int Rating 46.9 kA
Mom Duty 2.3 kA
Mom Rating 78.0 kA
LC3-MCC LINE Relay (50/51P)
LC3-MCC LINE Relay (50/51G)
P-LC3-TXR1
T-3
Nominal kVA 500 kVA
Pri Rated Voltage 4160 V
Sec Rated Voltage 480 V
Z% 4.80 %
To Page 2
LC4-MCC LINE Bkr
Int Duty 1.9 kA
Int Rating 46.9 kA
Mom Duty 2.3 kA
Mom Rating 78.0 kA
LC4-MCC LINE Relay (50/51P)
LC4-MCC LINE Relay (50/51G)
P-LC4-TXR
T-4
Nominal kVA 500 kVA
Pri Rated Voltage 4160 V
Sec Rated Voltage 480 V
Z% 5.00 %
To Page 3
BB-ESB3-MCC LINE Bkr
Int Duty 1.9 kA
Int Rating 46.9 kA
Mom Duty 2.3 kA
Mom Rating 78.0 kA
BB-ESB3-MCC LINE (50/51P)
BB-ESB3-MCC LINE (50/51G)
P-ESB3-TXR
BB-ESB3-TXR1
Nominal kVA 500 kVA
Pri Rated Voltage 4160 V
Sec Rated Voltage 600 V
Z% 5.00 %
To Page 4
BB-ESB4-MCC LINE Bkr
Int Duty 1.9 kA
Int Rating 46.9 kA
Mom Duty 2.3 kA
Mom Rating 78.0 kA
BB-ESB4-MCC LINE (50/51P)
BB-ESB4-MCC LINE (50/51G)
P-ESB4-TXR
BB-ESB4-TXR1
Nominal kVA 100 kVA
Pri Rated Voltage 4160 V
Sec Rated Voltage 600 V
Z% 5.00 %
To Page 5
BB-ESB5-MCC LINE Bkr
Int Duty 1.9 kA
Int Rating 46.9 kA
Mom Duty 2.3 kA
Mom Rating 78.0 kA
BB-ESB5-MCC LINE (50/51P)
BB-ESB5-MCC LINE (50/51G)
P-ESB5-TXR
BB-ESB5-TXR1
Nominal kVA 500 kVA
Pri Rated Voltage 4160 V
Sec Rated Voltage 600 V
Z% 5.00 %
To Page 6


From Page 1
T-3
Nominal kVA 500 kVA
Pri Rated Voltage 4160 V
Sec Rated Voltage 480 V
Z% 4.80 %
MCC-LC-3 MAIN BK Line Side
ANSI Sym 3P LV 7.9 kA
GEN-LC-3
MCC-LC-3 MAIN BK
Int Duty 8.9 kA
Int Rating 30.0 kA
G-LC-3 BK
ATS-LC3 (NORM)
ATS-LC3 (EMERG)
ANSI Sym 3P LV 0.0 kA
N
E
ATS-LC-3
Burnaby Terminal
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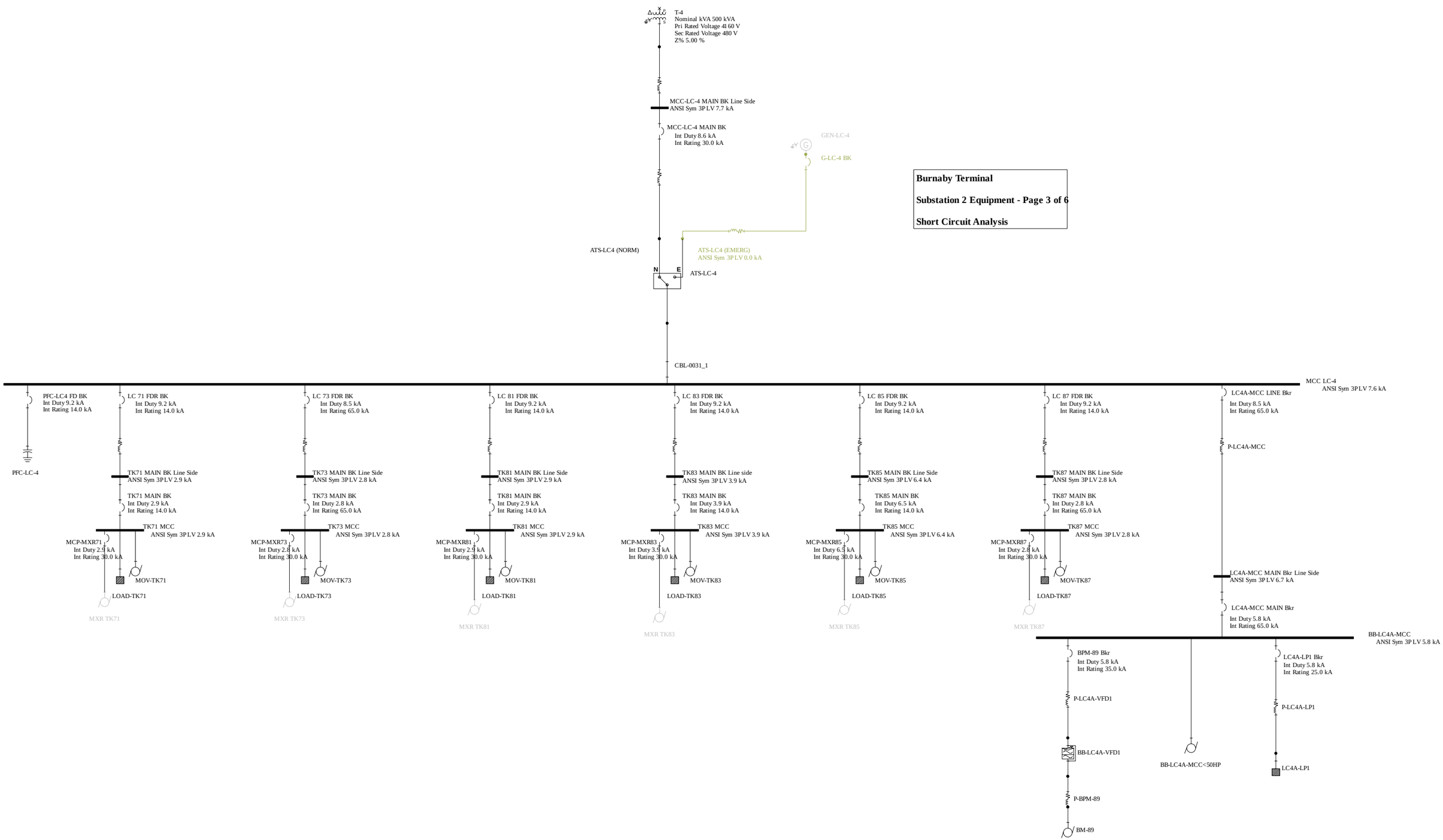
Short Circuit Analysis
MCC LC-3
ANSI Sym 3P LV 7.9 kA
LC3A-MCC LINE Bkr
Int Duty 8.8 kA
Int Rating 65.0 kA
PFC FD BK
Int Duty 9.4 kA
Int Rating 14.0 kA
LC 90/88 FDR BK
Int Duty 8.8 kA
Int Rating 35.0 kA
LC 82 FDR BK
Int Duty 9.4 kA
Int Rating 14.0 kA
LC 84 FDR BK
Int Duty 9.4 kA
Int Rating 14.0 kA
LC 86 FDR BK
Int Duty 9.4 kA
Int Rating 14.0 kA
LC 72 FDR BK
Int Duty 9.4 kA
Int Rating 14.0 kA
LC 74 FDR BK
Int Duty 8.8 kA
Int Rating 35.0 kA
P-LC3A-MCC
PFC-LC-3
TK90/88 MAIN BK Line Side
ANSI Sym 3P LV 4.9 kA
TK90/88 MAIN BK
Int Duty 4.9 kA
Int Rating 65.0 kA
TK90/88 MCC
ANSI Sym 3P LV 4.9 kA
MCP-MXR88
Int Duty 4.9 kA
Int Rating 30.0 kA
MCP-MXR90
Int Duty 4.9 kA
Int Rating 30.0 kA
MOV-TK88
MOV-TK90
LOAD-TK88
LOAD-TK90
MXR TK88
MXR TK90
TK82 MAIN BK Line Side
ANSI Sym 3P LV 3.1 kA
TK82 MAIN BK
Int Duty 3.1 kA
Int Rating 14.0 kA
TK82 MCC
ANSI Sym 3P LV 3.1 kA
MCP-MXR82
Int Duty 3.1 kA
Int Rating 30.0 kA
O/L-MXR82
MOV-TK82
LOAD-TK82
MXR TK82
TK84 MAIN BK Line Side
ANSI Sym 3P LV 4.8 kA
TK84 MAIN BK
Int Duty 4.8 kA
Int Rating 14.0 kA
TK84 MCC
ANSI Sym 3P LV 4.8 kA
MCP-MXR84
Int Duty 4.8 kA
Int Rating 30.0 kA
O/L-MXR84
MOV-TK84
LOAD-TK84
MXR TK84
TK86 MAIN BK Line Side
ANSI Sym 3P LV 3.7 kA
TK86 MAIN BK
Int Duty 3.7 kA
Int Rating 14.0 kA
TK86 MCC
ANSI Sym 3P LV 3.7 kA
MCP-MXR86
Int Duty 3.7 kA
Int Rating 30.0 kA
O/L-MXR86
MOV-TK86
LOAD-TK86
MXR TK86
TK72 MAIN BK Line Side
ANSI Sym 3P LV 2.8 kA
TK72 MAIN BK
Int Duty 2.8 kA
Int Rating 14.0 kA
TK72 MCC
ANSI Sym 3P LV 2.8 kA
MCP-MXR72
Int Duty 2.8 kA
Int Rating 30.0 kA
O/L-MXR72
MOV-TK72
LOAD-TK72
MXR TK72
TK74 MAIN BK Line Side
ANSI Sym 3P LV 2.3 kA
TK74 MAIN BK
Int Duty 2.3 kA
Int Rating 14.0 kA
TK74 MCC
ANSI Sym 3P LV 2.3 kA
MCP-MXR74
Int Duty 2.3 kA
Int Rating 30.0 kA
O/L-MXR74
MOV-TK74
LOAD-TK74
MXR TK74
LC3A-MCC MAIN Bkr Line Side
ANSI Sym 3P LV 6.9 kA
LC3A-MCC MAIN Bkr
Int Duty 6.9 kA
Int Rating 65.0 kA
BB-LC3A-MCC
ANSI Sym 3P LV 6.9 kA
BM-80 Bkr
Int Duty 6.9 kA
Int Rating 35.0 kA
P-LC3A-VFD1
BB-LC3A-VFD1
P-BM-80
BM-80
BB-LC3A-MCC<50HP
LC3A-LP1 Bkr
Int Duty 6.9 kA
Int Rating 25.0 kA
P-LC3A-LP1
LC3A-LP1

From Page 1



Burnaby Terminal

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Short Circuit Analysis

Burnaby Terminal

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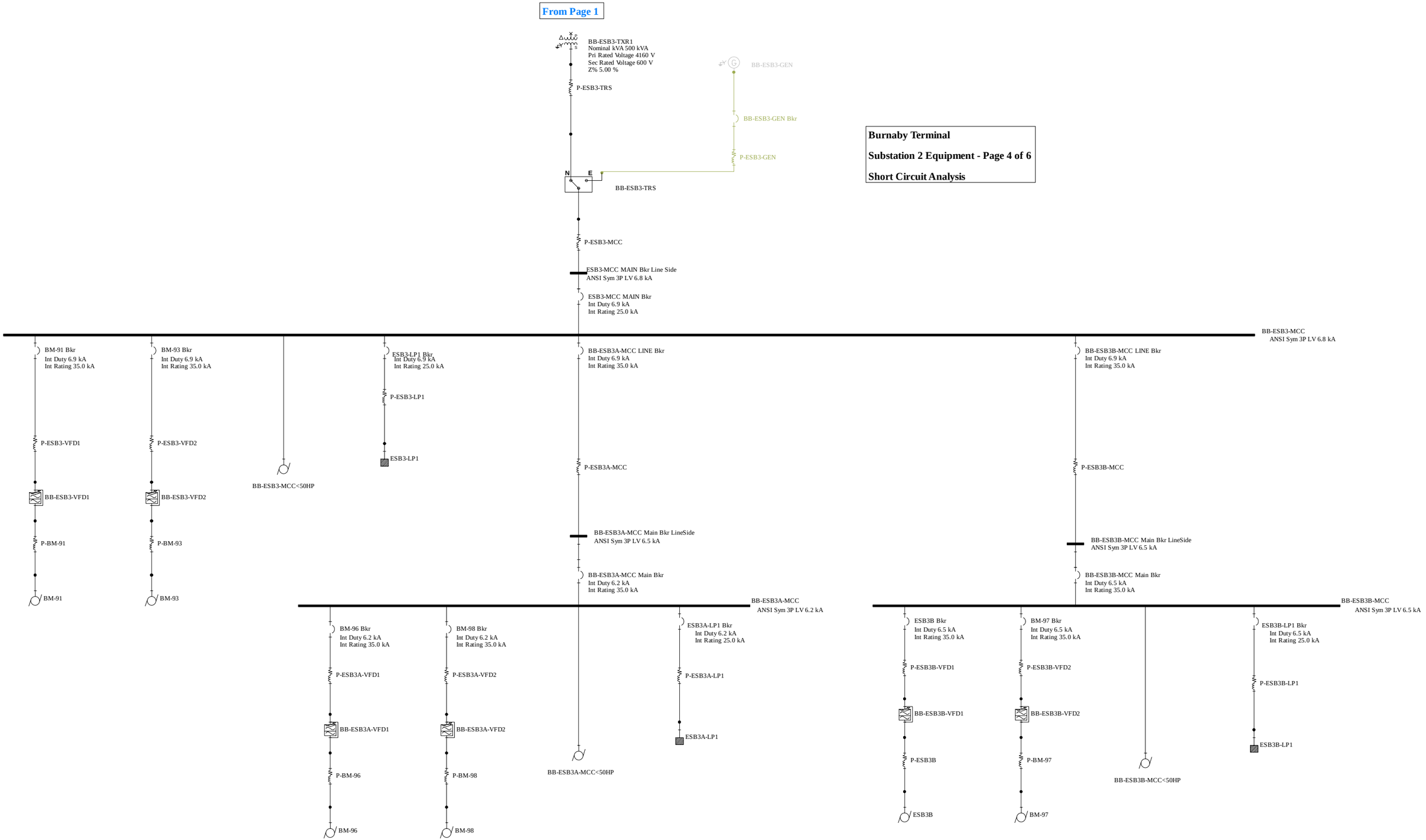
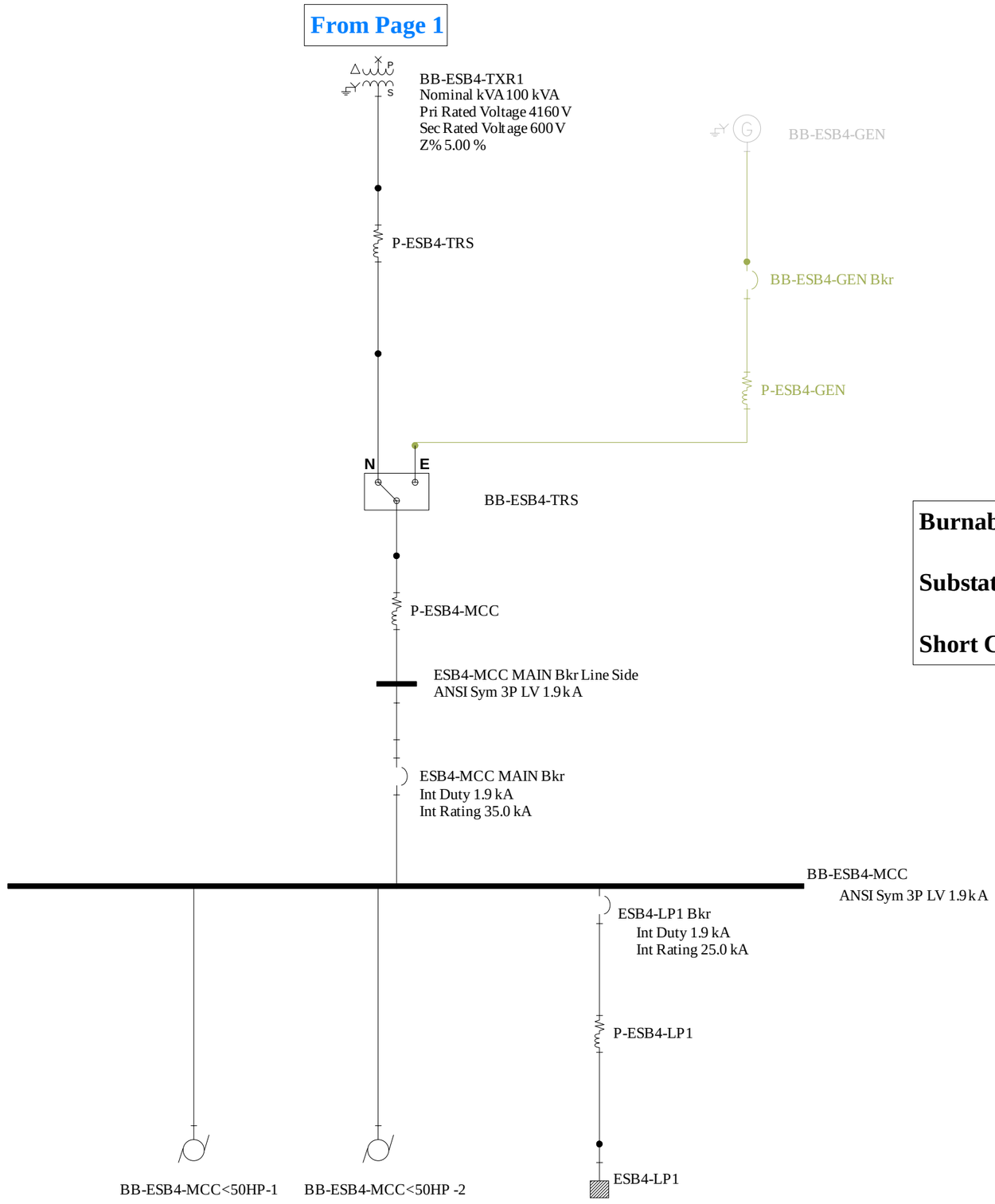
Short Circuit Analysis





Burnaby Terminal

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Short Circuit Analysis

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Burnaby Terminal

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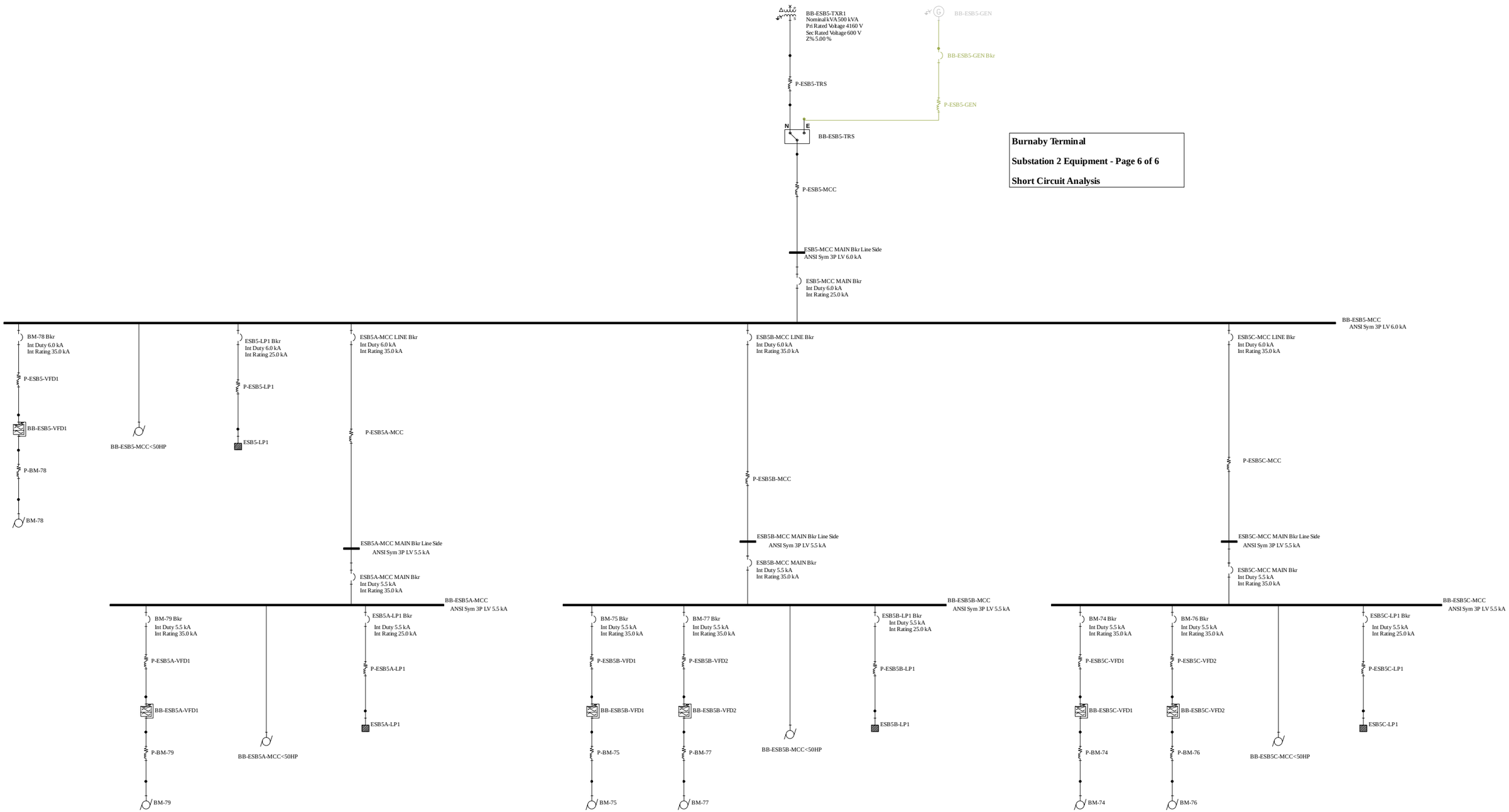
Short Circuit Analysis



Burnaby Terminal

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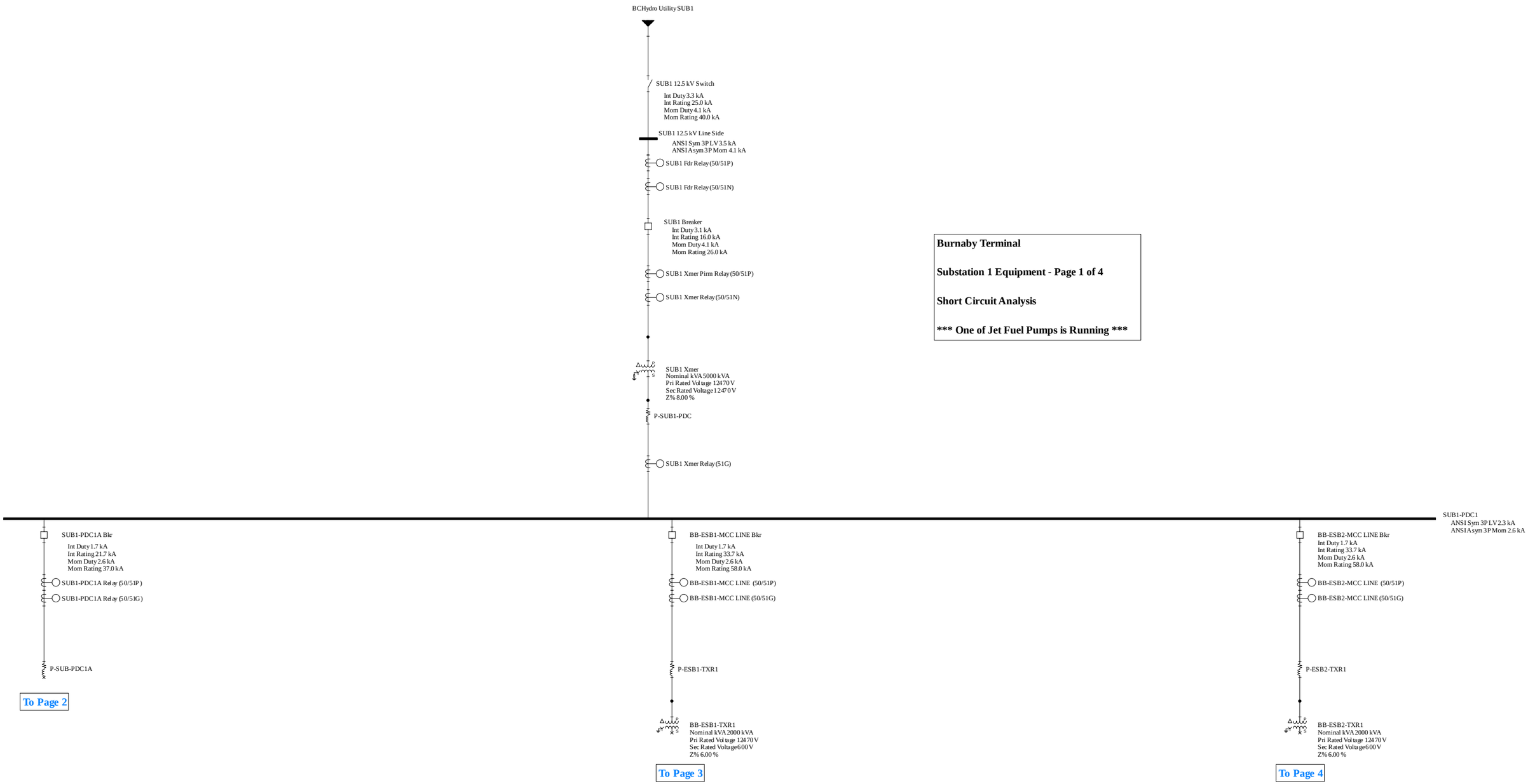
Short Circuit Analysis

***** One of Jet Fuel Pumps is Running *****



From Page 1

Burnaby Terminal

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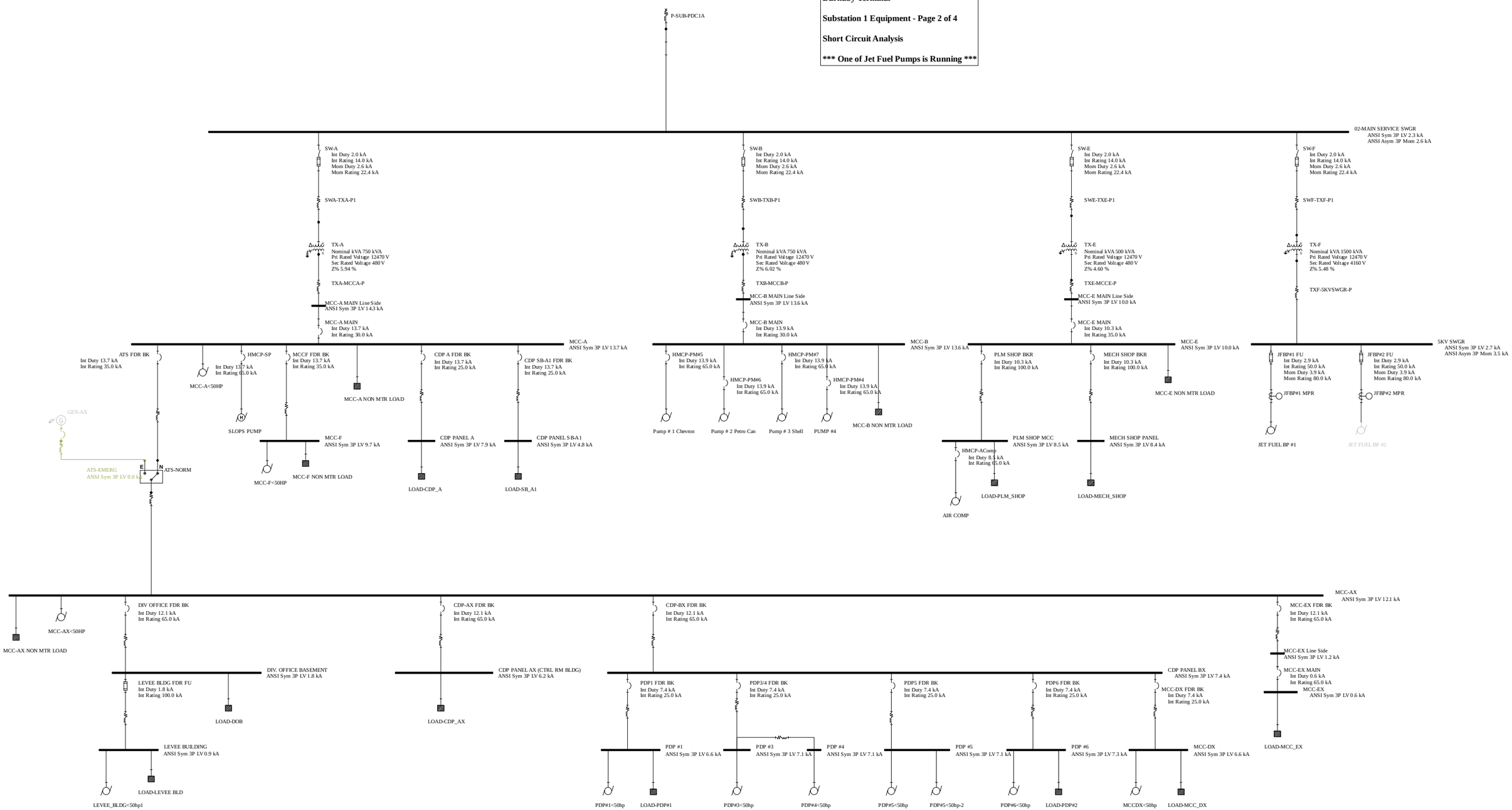
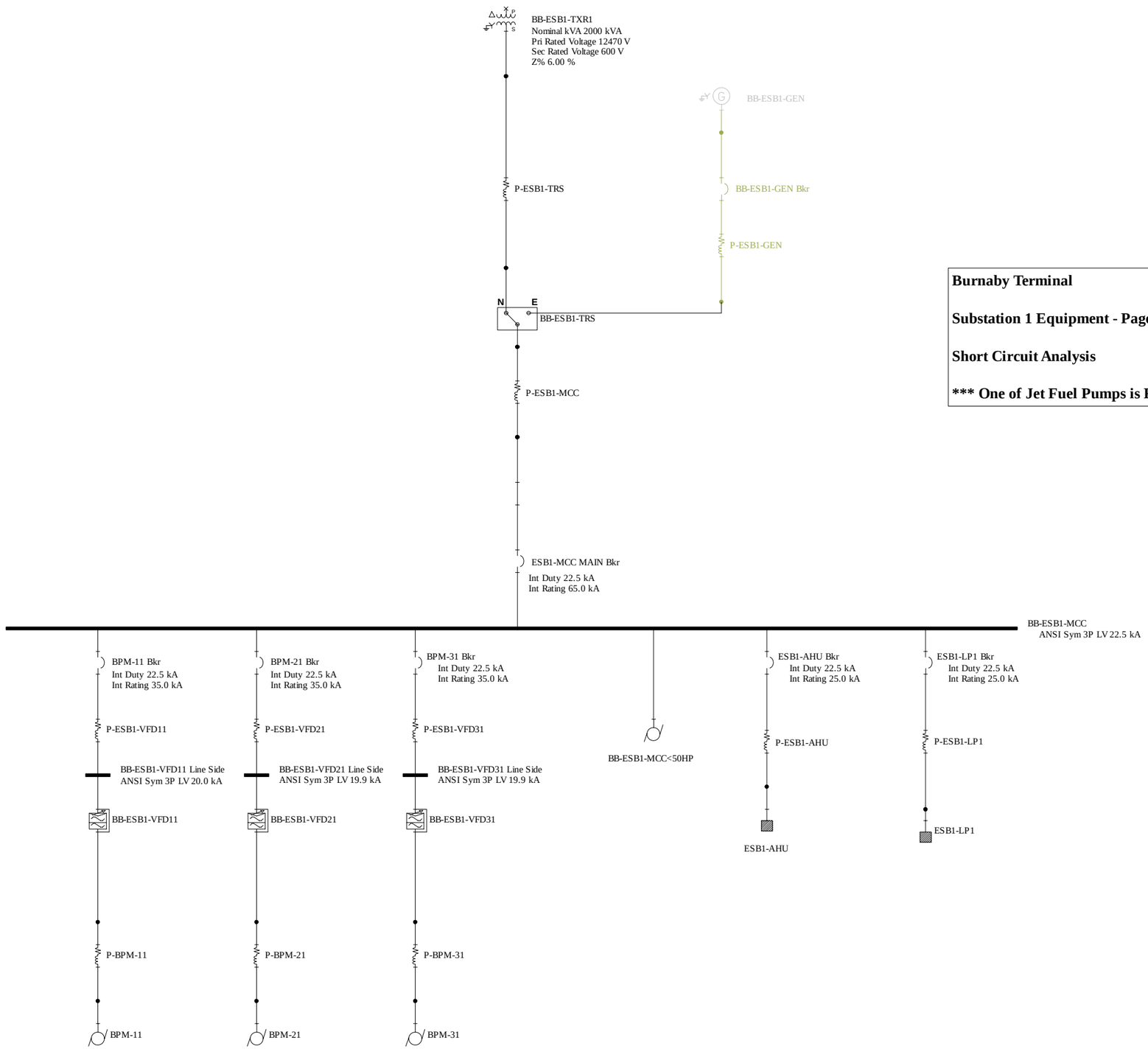
Short Circuit Analysis

***** One of Jet Fuel Pumps is Running *****



From Page 1



Burnaby Terminal

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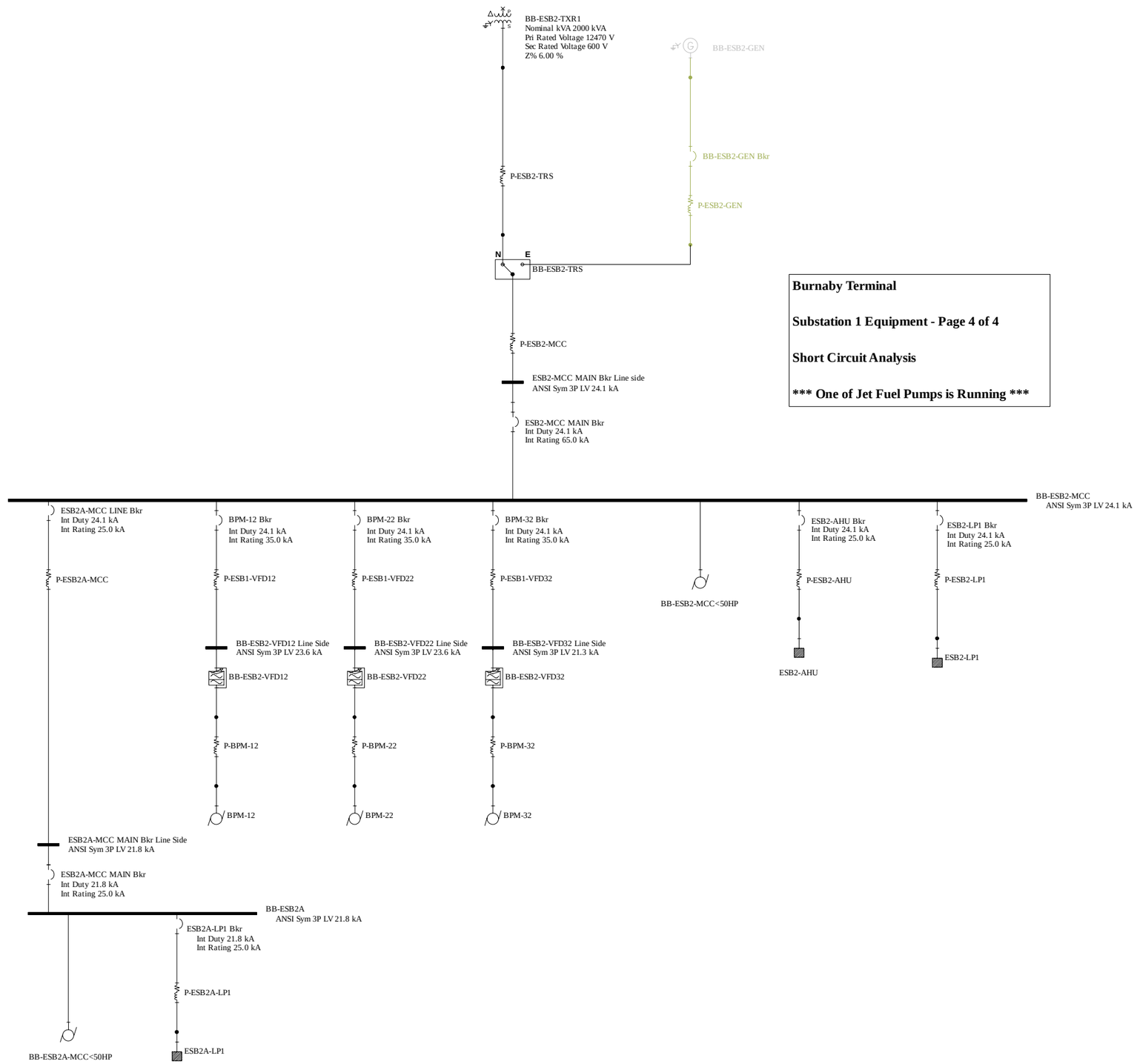
Short Circuit Analysis

***** One of Jet Fuel Pumps is Running *****

From Page 1



Burnaby Terminal

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Short Circuit Analysis

***** One of Jet Fuel Pumps is Running *****

Project: Burnaby Terminal
Kinder Morgan
Burnaby Terminal
Power System Study

ANSI Complete Fault Report

One of Jet Fuel Pumps is Running

A_FAULT Settings

Fault Type	3 Phase+Unbalanced	**LV Duty**	Yes	**Int Duty**	Yes
Faulted Bus	All Buses	**LV Report**	Complete	**Int Report**	Complete
Include Tap	No	**Mom Duty**	Yes	**Solution Method**	E/Z
Pre-fault Voltage	1.0000	**Mom Report**	Complete	**NACD Option**	Interpolated

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
02-MAIN SERVICE SWGR	12,470	3 Phase:	2.29	49.4	6.59	3.04	2.68	Z1:	2.02	0.52	3.11
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.02	---	---
		LL:	1.98	24.7	---	---	---	Z0:	926.16	---	---
LLG Gnd Return kA:	0.007	LLG:	1.98	24.7	---	---	---				
5KV SWGR	4,160	3 Phase:	2.75	19.8	7.86	3.79	3.29	Z1:	5.05	0.13	0.86
		SLG:	3.02	12.5	7.28	4.10	---	Z2:	5.05	---	---
		LL:	2.38	9.9	---	---	---	Z0:	3.71	---	---
LLG Gnd Return kA:	3.340	LLG:	2.92	12.1	---	---	---				
BB-ESB1-MCC	600	3 Phase:	23.08	24.0	4.61	28.38	25.80	Z1:	4.17	0.00	0.01
		SLG:	20.44	12.3	2.16	21.52	---	Z2:	4.17	---	---
		LL:	19.99	12.0	---	---	---	Z0:	6.23	---	---
LLG Gnd Return kA:	17.769	LLG:	24.69	14.8	---	---	---				
BB-ESB1-TXR1 Prim Side	12,470	3 Phase:	2.29	49.4	6.53	3.04	2.68	Z1:	2.02	0.52	3.11
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.02	---	---
		LL:	1.98	24.7	---	---	---	Z0:	926.16	---	---
LLG Gnd Return kA:	0.007	LLG:	1.98	24.7	---	---	---				
BB-ESB1-TXR1 Sec Side	600	3 Phase:	24.90	25.9	6.39	32.91	29.05	Z1:	3.87	0.00	0.01
		SLG:	26.91	16.1	6.62	35.84	---	Z2:	3.87	---	---
		LL:	21.56	12.9	---	---	---	Z0:	3.00	---	---
LLG Gnd Return kA:	29.266	LLG:	25.82	15.5	---	---	---				
BB-ESB1-VFD11 Line Side	600	3 Phase:	22.67	23.6	4.33	27.47	25.13	Z1:	4.25	0.00	0.01
		SLG:	19.66	11.8	2.01	20.50	---	Z2:	4.25	---	---
		LL:	19.63	11.8	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.775	LLG:	24.15	14.5	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
BB-ESB1-VFD21	600	3 Phase:	22.67	23.6	4.33	27.47	25.13	Z1:	4.25	0.00	0.01
Line Side		SLG:	19.66	11.8	2.01	20.50	---	Z2:	4.25	---	---
		LL:	19.63	11.8	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.775	LLG:	24.15	14.5	---	---	---				
BB-ESB1-VFD31	600	3 Phase:	22.67	23.6	4.33	27.47	25.13	Z1:	4.25	0.00	0.01
Line Side		SLG:	19.66	11.8	2.01	20.50	---	Z2:	4.25	---	---
		LL:	19.63	11.8	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.775	LLG:	24.15	14.5	---	---	---				
BB-ESB2A	600	3 Phase:	21.92	22.8	3.29	24.96	23.46	Z1:	4.39	0.01	0.01
		SLG:	17.33	10.4	1.51	17.59	---	Z2:	4.39	---	---
		LL:	18.98	11.4	---	---	---	Z0:	8.49	---	---
LLG Gnd Return kA:	13.821	LLG:	22.73	13.6	---	---	---				
BB-ESB2-MCC	600	3 Phase:	24.16	25.1	4.76	29.92	27.12	Z1:	3.98	0.00	0.01
		SLG:	20.99	12.6	2.14	22.09	---	Z2:	3.98	---	---
		LL:	20.92	12.6	---	---	---	Z0:	6.23	---	---
LLG Gnd Return kA:	17.969	LLG:	25.70	15.4	---	---	---				
BB-ESB2-TXR1	12,470	3 Phase:	2.29	49.4	6.54	3.04	2.68	Z1:	2.02	0.52	3.11
Prim Side		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.02	---	---
		LL:	1.98	24.7	---	---	---	Z0:	926.16	---	---
LLG Gnd Return kA:	0.007	LLG:	1.98	24.7	---	---	---				
BB-ESB2-TXR1	600	3 Phase:	25.82	26.8	6.32	34.06	30.09	Z1:	3.73	0.00	0.01
Sec Side		SLG:	27.62	16.6	6.57	36.74	---	Z2:	3.73	---	---
		LL:	22.36	13.4	---	---	---	Z0:	3.00	---	---
LLG Gnd Return kA:	29.684	LLG:	26.58	15.9	---	---	---				
BB-ESB2-VFD12	600	3 Phase:	23.70	24.6	4.45	28.90	26.37	Z1:	4.06	0.00	0.01
Line Side		SLG:	20.17	12.1	1.99	21.01	---	Z2:	4.06	---	---
		LL:	20.53	12.3	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.951	LLG:	25.11	15.1	---	---	---				
BB-ESB2-VFD22	600	3 Phase:	23.70	24.6	4.45	28.90	26.37	Z1:	4.06	0.00	0.01
Line Side		SLG:	20.17	12.1	1.99	21.01	---	Z2:	4.06	---	---
		LL:	20.53	12.3	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.951	LLG:	25.11	15.1	---	---	---				
BB-ESB2-VFD32	600	3 Phase:	23.70	24.6	4.45	28.90	26.37	Z1:	4.06	0.00	0.01
Line Side		SLG:	20.17	12.1	1.99	21.01	---	Z2:	4.06	---	---
		LL:	20.53	12.3	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.951	LLG:	25.11	15.1	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
BB-ESB3A-MCC	600	3 Phase:	6.19	6.4	2.78	6.80	6.50	Z1:	15.55	0.02	0.05
		SLG:	5.72	3.4	1.72	5.87	---	Z2:	15.55	---	---
		LL:	5.36	3.2	---	---	---	Z0:	20.50	---	---
LLG Gnd Return kA:	5.200	LLG:	6.64	4.0	---	---	---				
BB-ESB3A-MCC Main Bkr LineSide	600	3 Phase:	6.48	6.7	3.28	7.37	6.93	Z1:	14.85	0.02	0.05
		SLG:	6.27	3.8	2.10	6.58	---	Z2:	14.85	---	---
		LL:	5.61	3.4	---	---	---	Z0:	17.15	---	---
LLG Gnd Return kA:	5.965	LLG:	7.02	4.2	---	---	---				
BB-ESB3B-MCC	600	3 Phase:	6.49	6.7	3.34	7.41	6.96	Z1:	14.83	0.02	0.05
		SLG:	6.27	3.8	2.12	6.59	---	Z2:	14.83	---	---
		LL:	5.62	3.4	---	---	---	Z0:	17.15	---	---
LLG Gnd Return kA:	5.968	LLG:	7.03	4.2	---	---	---				
BB-ESB3B-MCC Main Bkr LineSide	600	3 Phase:	6.49	6.7	3.34	7.41	6.96	Z1:	14.83	0.02	0.05
		SLG:	6.27	3.8	2.12	6.59	---	Z2:	14.83	---	---
		LL:	5.62	3.4	---	---	---	Z0:	17.15	---	---
LLG Gnd Return kA:	5.968	LLG:	7.03	4.2	---	---	---				
BB-ESB3-MCC	600	3 Phase:	6.78	7.0	4.12	8.12	7.47	Z1:	14.20	0.01	0.05
		SLG:	6.87	4.1	2.80	7.56	---	Z2:	14.20	---	---
		LL:	5.87	3.5	---	---	---	Z0:	14.06	---	---
LLG Gnd Return kA:	6.890	LLG:	7.37	4.4	---	---	---				
BB-ESB3-TXR1 Prim Side	4,160	3 Phase:	2.33	16.8	4.50	2.85	2.59	Z1:	5.96	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.96	---	---
		LL:	2.02	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
BB-ESB3-TXR1 Sec Side	600	3 Phase:	7.11	7.4	4.81	8.83	8.00	Z1:	13.53	0.01	0.05
		SLG:	7.79	4.7	4.78	9.66	---	Z2:	13.53	---	---
		LL:	6.16	3.7	---	---	---	Z0:	10.00	---	---
LLG Gnd Return kA:	8.610	LLG:	7.51	4.5	---	---	---				
BB-ESB4-MCC	600	3 Phase:	1.88	2.0	3.43	2.16	2.02	Z1:	51.20	0.07	0.17
		SLG:	1.72	1.0	2.13	1.81	---	Z2:	51.20	---	---
		LL:	1.63	1.0	---	---	---	Z0:	67.40	---	---
LLG Gnd Return kA:	1.566	LLG:	1.95	1.2	---	---	---				
BB-ESB4-TXR1 Prim Side	4,160	3 Phase:	2.33	16.8	4.48	2.84	2.59	Z1:	5.97	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.97	---	---
		LL:	2.01	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
BB-ESB4-TXR1 Sec Side	600	3 Phase:	2.02	2.1	4.06	2.42	2.22	Z1:	47.57	0.04	0.17
		SLG:	1.99	1.2	3.77	2.34	---	Z2:	47.57	---	---
		LL:	1.75	1.1	---	---	---	Z0:	50.00	---	---
LLG Gnd Return kA:	1.956	LLG:	2.02	1.2	---	---	---				
BB-ESB5A-MCC	600	3 Phase:	5.50	5.7	2.12	5.78	5.64	Z1:	17.50	0.03	0.05
		SLG:	4.42	2.7	1.06	4.43	---	Z2:	17.50	---	---
		LL:	4.76	2.9	---	---	---	Z0:	32.72	---	---
LLG Gnd Return kA:	3.564	LLG:	5.73	3.4	---	---	---				
BB-ESB5B-MCC	600	3 Phase:	5.54	5.8	2.27	5.87	5.71	Z1:	17.38	0.03	0.05
		SLG:	4.44	2.7	1.09	4.45	---	Z2:	17.38	---	---
		LL:	4.79	2.9	---	---	---	Z0:	32.72	---	---
LLG Gnd Return kA:	3.572	LLG:	5.77	3.5	---	---	---				
BB-ESB5C-MCC	600	3 Phase:	5.54	5.8	2.27	5.87	5.71	Z1:	17.38	0.03	0.05
		SLG:	4.44	2.7	1.09	4.45	---	Z2:	17.38	---	---
		LL:	4.79	2.9	---	---	---	Z0:	32.72	---	---
LLG Gnd Return kA:	3.572	LLG:	5.77	3.5	---	---	---				
BB-ESB5-MCC	600	3 Phase:	6.03	6.3	2.61	6.55	6.29	Z1:	15.96	0.03	0.05
		SLG:	5.22	3.1	1.28	5.26	---	Z2:	15.96	---	---
		LL:	5.22	3.1	---	---	---	Z0:	25.55	---	---
LLG Gnd Return kA:	4.425	LLG:	6.45	3.9	---	---	---				
BB-ESB5-TXR1 Prim Side	4,160	3 Phase:	2.33	16.8	4.50	2.85	2.59	Z1:	5.96	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.96	---	---
		LL:	2.02	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
BB-ESB5-TXR1 Sec Side	600	3 Phase:	7.15	7.4	4.52	8.75	7.97	Z1:	13.47	0.01	0.05
		SLG:	7.82	4.7	4.56	9.59	---	Z2:	13.47	---	---
		LL:	6.19	3.7	---	---	---	Z0:	10.00	---	---
LLG Gnd Return kA:	8.626	LLG:	7.51	4.5	---	---	---				
BB-LC3A-MCC	480	3 Phase:	6.86	5.7	2.44	7.36	7.11	Z1:	17.53	0.02	0.04
		SLG:	6.69	3.2	1.66	6.85	---	Z2:	17.53	---	---
		LL:	5.94	2.9	---	---	---	Z0:	19.89	---	---
LLG Gnd Return kA:	6.409	LLG:	7.50	3.6	---	---	---				
BB-LC4A-MCC	480	3 Phase:	5.84	4.9	1.85	6.04	5.94	Z1:	20.58	0.02	0.04
		SLG:	5.11	2.5	1.20	5.13	---	Z2:	20.58	---	---
		LL:	5.06	2.4	---	---	---	Z0:	31.14	---	---
LLG Gnd Return kA:	4.432	LLG:	6.14	2.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
CDP PANEL A	480	3 Phase:	7.89	6.6	1.26	7.94	7.91	Z1:	15.25	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	15.25	---	---
		LL:	6.83	3.3	---	---	---	Z0:	180,046.70	---	---
LLG Gnd Return kA:	0.001	LLG:	6.83	3.3	---	---	---				
CDP PANEL AX (CTRL RM BLDG)	480	3 Phase:	6.25	5.2	1.05	6.26	6.25	Z1:	19.26	0.03	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	19.26	---	---
		LL:	5.41	2.6	---	---	---	Z0:	180,053.80	---	---
LLG Gnd Return kA:	0.001	LLG:	5.41	2.6	---	---	---				
CDP PANEL BX	480	3 Phase:	7.38	6.1	2.57	7.99	7.69	Z1:	16.31	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.31	---	---
		LL:	6.39	3.1	---	---	---	Z0:	180,052.30	---	---
LLG Gnd Return kA:	0.001	LLG:	6.39	3.1	---	---	---				
CDP PANEL SB-A1	480	3 Phase:	4.80	4.0	0.57	4.80	4.80	Z1:	25.05	0.05	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	25.05	---	---
		LL:	4.16	2.0	---	---	---	Z0:	180,066.20	---	---
LLG Gnd Return kA:	0.001	LLG:	4.16	2.0	---	---	---				
DIV. OFFICE BASEMENT	480	3 Phase:	1.80	1.5	0.53	1.80	1.80	Z1:	66.79	0.14	0.07
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	66.79	---	---
		LL:	1.56	0.7	---	---	---	Z0:	180,128.50	---	---
LLG Gnd Return kA:	0.001	LLG:	1.56	0.7	---	---	---				
ESB2A-MCC MAIN Bkr Line	600	3 Phase:	21.92	22.8	3.29	24.96	23.46	Z1:	4.39	0.01	0.01
		SLG:	17.33	10.4	1.51	17.59	---	Z2:	4.39	---	---
		LL:	18.98	11.4	---	---	---	Z0:	8.49	---	---
LLG Gnd Return kA:	13.821	LLG:	22.73	13.6	---	---	---				
ESB2-MCC MAIN Bkr Line side	600	3 Phase:	24.16	25.1	4.76	29.93	27.13	Z1:	3.98	0.00	0.01
		SLG:	21.00	12.6	2.15	22.09	---	Z2:	3.98	---	---
		LL:	20.93	12.6	---	---	---	Z0:	6.23	---	---
LLG Gnd Return kA:	17.976	LLG:	25.70	15.4	---	---	---				
ESB3-MCC MAIN Bkr Line Side	600	3 Phase:	6.78	7.0	4.12	8.12	7.47	Z1:	14.20	0.01	0.05
		SLG:	6.87	4.1	2.80	7.56	---	Z2:	14.20	---	---
		LL:	5.87	3.5	---	---	---	Z0:	14.06	---	---
LLG Gnd Return kA:	6.890	LLG:	7.37	4.4	---	---	---				
ESB4-MCC MAIN Bkr Line Side	600	3 Phase:	1.88	2.0	3.43	2.16	2.02	Z1:	51.20	0.07	0.17
		SLG:	1.72	1.0	2.13	1.81	---	Z2:	51.20	---	---
		LL:	1.63	1.0	---	---	---	Z0:	67.36	---	---
LLG Gnd Return kA:	1.566	LLG:	1.95	1.2	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
ESB5A-MCC MAIN Bkr Line	600	3 Phase:	5.51	5.7	2.12	5.79	5.65	Z1:	17.47	0.03	0.05
		SLG:	4.43	2.7	1.07	4.44	---	Z2:	17.47	---	---
		LL:	4.77	2.9	---	---	---	Z0:	32.61	---	---
LLG Gnd Return kA:	3.575	LLG:	5.74	3.4	---	---	---				
ESB5B-MCC MAIN Bkr Line	600	3 Phase:	5.54	5.8	2.27	5.88	5.71	Z1:	17.36	0.03	0.05
		SLG:	4.45	2.7	1.09	4.47	---	Z2:	17.36	---	---
		LL:	4.80	2.9	---	---	---	Z0:	32.61	---	---
LLG Gnd Return kA:	3.583	LLG:	5.78	3.5	---	---	---				
ESB5C-MCC MAIN Bkr Line	600	3 Phase:	5.54	5.8	2.27	5.88	5.71	Z1:	17.36	0.03	0.05
		SLG:	4.45	2.7	1.09	4.47	---	Z2:	17.36	---	---
		LL:	4.80	2.9	---	---	---	Z0:	32.61	---	---
LLG Gnd Return kA:	3.583	LLG:	5.78	3.5	---	---	---				
ESB5-MCC MAIN Bkr Line Side	600	3 Phase:	6.03	6.3	2.61	6.55	6.29	Z1:	15.95	0.03	0.05
		SLG:	5.22	3.1	1.28	5.26	---	Z2:	15.95	---	---
		LL:	5.22	3.1	---	---	---	Z0:	25.53	---	---
LLG Gnd Return kA:	4.427	LLG:	6.45	3.9	---	---	---				
LC3A-MCC MAIN Bkr Line Side	480	3 Phase:	6.86	5.7	2.44	7.36	7.11	Z1:	17.53	0.02	0.04
		SLG:	6.69	3.2	1.66	6.85	---	Z2:	17.53	---	---
		LL:	5.94	2.9	---	---	---	Z0:	19.89	---	---
LLG Gnd Return kA:	6.409	LLG:	7.50	3.6	---	---	---				
LC4A-MCC MAIN Bkr Line Side	480	3 Phase:	6.69	5.6	2.48	7.20	6.95	Z1:	17.97	0.02	0.04
		SLG:	6.55	3.1	1.73	6.72	---	Z2:	17.97	---	---
		LL:	5.80	2.8	---	---	---	Z0:	20.06	---	---
LLG Gnd Return kA:	6.308	LLG:	7.28	3.5	---	---	---				
LEVEE BUILDING	480	3 Phase:	0.92	0.8	0.34	0.92	0.92	Z1:	130.57	0.29	0.09
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	130.57	---	---
		LL:	0.80	0.4	---	---	---	Z0:	180,234.30	---	---
LLG Gnd Return kA:	0.001	LLG:	0.80	0.4	---	---	---				
MCC LC-3	480	3 Phase:	7.86	6.5	4.44	9.58	8.74	Z1:	15.30	0.01	0.03
		SLG:	8.77	4.2	4.12	10.51	---	Z2:	15.30	---	---
		LL:	6.81	3.3	---	---	---	Z0:	10.53	---	---
LLG Gnd Return kA:	9.926	LLG:	8.56	4.1	---	---	---				
MCC LC-4	480	3 Phase:	7.63	6.3	4.41	9.29	8.48	Z1:	15.76	0.01	0.04
		SLG:	8.48	4.1	4.33	10.28	---	Z2:	15.76	---	---
		LL:	6.61	3.2	---	---	---	Z0:	11.03	---	---
LLG Gnd Return kA:	9.543	LLG:	8.17	3.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
MCC-A	480	3 Phase:	13.76	11.4	4.44	16.77	15.30	Z1:	8.74	0.00	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	8.74	---	---
		LL:	11.91	5.7	---	---	---	Z0:	180,034.80	---	---
LLG Gnd Return kA:	0.001	LLG:	11.91	5.7	---	---	---				
MCC-A MAIN Line Side	480	3 Phase:	14.32	11.9	4.82	17.78	16.10	Z1:	8.40	0.00	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	8.40	---	---
		LL:	12.40	6.0	---	---	---	Z0:	180,034.00	---	---
LLG Gnd Return kA:	0.001	LLG:	12.40	6.0	---	---	---				
MCC-AX	480	3 Phase:	12.14	10.1	2.96	13.52	12.84	Z1:	9.90	0.01	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	9.90	---	---
		LL:	10.52	5.0	---	---	---	Z0:	180,037.90	---	---
LLG Gnd Return kA:	0.001	LLG:	10.52	5.0	---	---	---				
MCC-B	480	3 Phase:	13.66	11.4	5.29	17.33	15.55	Z1:	8.81	0.00	0.02
		SLG:	0.00	0.0	0.02	0.00	---	Z2:	8.81	---	---
		LL:	11.83	5.7	---	---	---	Z0:	182,361.00	---	---
LLG Gnd Return kA:	0.001	LLG:	11.83	5.7	---	---	---				
MCC-B MAIN Line Side	480	3 Phase:	13.66	11.4	5.29	17.33	15.55	Z1:	8.81	0.00	0.02
		SLG:	0.00	0.0	0.02	0.00	---	Z2:	8.81	---	---
		LL:	11.83	5.7	---	---	---	Z0:	182,361.00	---	---
LLG Gnd Return kA:	0.001	LLG:	11.83	5.7	---	---	---				
MCC-DX	480	3 Phase:	6.66	5.5	2.26	7.06	6.86	Z1:	18.07	0.03	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	18.07	---	---
		LL:	5.76	2.8	---	---	---	Z0:	180,056.40	---	---
LLG Gnd Return kA:	0.001	LLG:	5.77	2.8	---	---	---				
MCC-E	480	3 Phase:	10.05	8.4	3.99	11.95	11.02	Z1:	11.97	0.01	0.03
		SLG:	10.27	4.9	3.92	12.17	---	Z2:	11.97	---	---
		LL:	8.70	4.2	---	---	---	Z0:	11.18	---	---
LLG Gnd Return kA:	10.511	LLG:	10.19	4.9	---	---	---				
MCC-E MAIN Line Side	480	3 Phase:	10.05	8.4	3.99	11.95	11.02	Z1:	11.97	0.01	0.03
		SLG:	10.27	4.9	3.92	12.17	---	Z2:	11.97	---	---
		LL:	8.70	4.2	---	---	---	Z0:	11.18	---	---
LLG Gnd Return kA:	10.511	LLG:	10.19	4.9	---	---	---				
MCC-EX	480	3 Phase:	0.63	0.5	0.40	0.63	0.63	Z1:	192.37	0.41	0.16
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	192.37	---	---
		LL:	0.54	0.3	---	---	---	Z0:	180,316.90	---	---
LLG Gnd Return kA:	0.001	LLG:	0.54	0.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
MCC-EX Line Side	480	3 Phase:	1.21	1.0	0.44	1.21	1.21	Z1:	99.58	0.21	0.09
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	99.58	---	---
		LL:	1.05	0.5	---	---	---	Z0:	180,177.40	---	---
LLG Gnd Return kA:	0.001	LLG:	1.05	0.5	---	---	---				
MCC-F	480	3 Phase:	9.76	8.1	1.78	10.05	9.91	Z1:	12.32	0.01	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	12.32	---	---
		LL:	8.46	4.1	---	---	---	Z0:	180,041.40	---	---
LLG Gnd Return kA:	0.001	LLG:	8.46	4.1	---	---	---				
MCC-LC-3 MAIN BK Line Side	480	3 Phase:	7.94	6.6	4.55	9.73	8.86	Z1:	15.15	0.01	0.03
		SLG:	8.94	4.3	4.26	10.79	---	Z2:	15.15	---	---
		LL:	6.88	3.3	---	---	---	Z0:	10.09	---	---
LLG Gnd Return kA:	10.215	LLG:	8.69	4.2	---	---	---				
MCC-LC-4 MAIN BK Line Side	480	3 Phase:	7.70	6.4	4.52	9.43	8.59	Z1:	15.61	0.01	0.04
		SLG:	8.63	4.1	4.48	10.54	---	Z2:	15.61	---	---
		LL:	6.67	3.2	---	---	---	Z0:	10.59	---	---
LLG Gnd Return kA:	9.807	LLG:	8.29	4.0	---	---	---				
MECH SHOP PANEL	480	3 Phase:	8.45	7.0	2.31	8.99	8.72	Z1:	14.23	0.01	0.03
		SLG:	8.09	3.9	2.19	8.53	---	Z2:	14.23	---	---
		LL:	7.32	3.5	---	---	---	Z0:	16.18	---	---
LLG Gnd Return kA:	7.748	LLG:	8.40	4.0	---	---	---				
PDP #1	480	3 Phase:	6.59	5.5	1.84	6.81	6.70	Z1:	18.24	0.03	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	18.24	---	---
		LL:	5.71	2.7	---	---	---	Z0:	180,056.40	---	---
LLG Gnd Return kA:	0.001	LLG:	5.71	2.7	---	---	---				
PDP #3	480	3 Phase:	7.11	5.9	2.32	7.57	7.34	Z1:	16.91	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.91	---	---
		LL:	6.16	3.0	---	---	---	Z0:	180,053.60	---	---
LLG Gnd Return kA:	0.001	LLG:	6.16	3.0	---	---	---				
PDP #4	480	3 Phase:	7.06	5.9	2.28	7.49	7.28	Z1:	17.04	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	17.04	---	---
		LL:	6.11	2.9	---	---	---	Z0:	180,053.90	---	---
LLG Gnd Return kA:	0.001	LLG:	6.11	2.9	---	---	---				
PDP #5	480	3 Phase:	7.11	5.9	2.27	7.54	7.32	Z1:	16.93	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.93	---	---
		LL:	6.15	3.0	---	---	---	Z0:	180,053.60	---	---
LLG Gnd Return kA:	0.001	LLG:	6.15	3.0	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
PDP #6	480	3 Phase:	7.29	6.1	2.46	7.84	7.57	Z1:	16.49	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.49	---	---
		LL:	6.32	3.0	---	---	---	Z0:	180,052.70	---	---
LLG Gnd Return kA:	0.001	LLG:	6.32	3.0	---	---	---				
PLM SHOP MCC	480	3 Phase:	8.48	7.0	2.38	9.06	8.77	Z1:	14.19	0.01	0.03
		SLG:	8.10	3.9	2.23	8.57	---	Z2:	14.19	---	---
		LL:	7.34	3.5	---	---	---	Z0:	16.18	---	---
LLG Gnd Return kA:	7.755	LLG:	8.43	4.0	---	---	---				
SUB1 12.5 kV Line Side	12,470	3 Phase:	3.49	75.5	5.21	4.42	3.97	Z1:	1.32	0.41	2.02
		SLG:	2.31	28.9	4.01	2.75	---	Z2:	1.32	---	---
		LL:	3.03	37.7	---	---	---	Z0:	3.36	---	---
LLG Gnd Return kA:	1.728	LLG:	3.21	40.0	---	---	---				
SUB1 Xmer Prim Side	12,470	3 Phase:	3.49	75.5	5.21	4.42	3.97	Z1:	1.32	0.41	2.02
		SLG:	2.31	28.9	4.01	2.75	---	Z2:	1.32	---	---
		LL:	3.03	37.7	---	---	---	Z0:	3.36	---	---
LLG Gnd Return kA:	1.728	LLG:	3.21	40.0	---	---	---				
SUB1 Xmer Sec Side	12,470	3 Phase:	2.29	49.5	6.79	3.07	2.70	Z1:	2.02	0.50	3.10
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.02	---	---
		LL:	1.98	24.7	---	---	---	Z0:	926.11	---	---
LLG Gnd Return kA:	0.007	LLG:	1.99	24.8	---	---	---				
SUB1-PDC1	12,470	3 Phase:	2.29	49.5	6.77	3.07	2.69	Z1:	2.02	0.50	3.10
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.02	---	---
		LL:	1.98	24.7	---	---	---	Z0:	926.13	---	---
LLG Gnd Return kA:	0.007	LLG:	1.99	24.8	---	---	---				
SUB2 12.5 kV Line Side	12,470	3 Phase:	2.47	53.4	2.59	2.68	2.58	Z1:	1.87	1.08	2.70
		SLG:	1.68	20.9	1.88	1.74	---	Z2:	1.87	---	---
		LL:	2.14	26.7	---	---	---	Z0:	4.58	---	---
LLG Gnd Return kA:	1.263	LLG:	2.34	29.1	---	---	---				
SUB2 Xmer Prim Side	12,470	3 Phase:	2.47	53.4	2.59	2.68	2.58	Z1:	1.87	1.08	2.70
		SLG:	1.68	20.9	1.88	1.74	---	Z2:	1.87	---	---
		LL:	2.14	26.7	---	---	---	Z0:	4.58	---	---
LLG Gnd Return kA:	1.263	LLG:	2.34	29.1	---	---	---				
SUB2 Xmer Sec Side	4,160	3 Phase:	2.34	16.9	4.71	2.90	2.63	Z1:	5.92	0.22	1.00
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.92	---	---
		LL:	2.03	8.4	---	---	---	Z0:	2,776.53	---	---
LLG Gnd Return kA:	0.007	LLG:	2.03	8.5	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
SUB2-PDC1	4,160	3 Phase:	2.34	16.8	4.63	2.88	2.62	Z1:	5.94	0.22	1.00
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.94	---	---
		LL:	2.02	8.4	---	---	---	Z0:	2,776.68	---	---
LLG Gnd Return kA:	0.007	LLG:	2.03	8.4	---	---	---				
T-3 Prim Side	4,160	3 Phase:	2.33	16.8	4.48	2.84	2.59	Z1:	5.97	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.97	---	---
		LL:	2.01	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
T-3 Sec Side	480	3 Phase:	8.01	6.7	4.69	9.88	8.97	Z1:	15.02	0.01	0.03
		SLG:	9.10	4.4	4.69	11.24	---	Z2:	15.02	---	---
		LL:	6.94	3.3	---	---	---	Z0:	9.60	---	---
LLG Gnd Return kA:	10.545	LLG:	8.70	4.2	---	---	---				
T-4 Prim Side	4,160	3 Phase:	2.33	16.8	4.48	2.84	2.59	Z1:	5.97	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.97	---	---
		LL:	2.01	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
T-4 Sec Side	480	3 Phase:	7.81	6.5	4.68	9.64	8.75	Z1:	15.39	0.01	0.03
		SLG:	8.85	4.2	4.69	10.92	---	Z2:	15.39	---	---
		LL:	6.77	3.2	---	---	---	Z0:	10.00	---	---
LLG Gnd Return kA:	10.195	LLG:	8.46	4.1	---	---	---				
TK71 MAIN BK Line Side	480	3 Phase:	2.91	2.4	1.02	2.92	2.91	Z1:	41.34	0.07	0.07
		SLG:	2.47	1.2	1.03	2.48	---	Z2:	41.34	---	---
		LL:	2.52	1.2	---	---	---	Z0:	63.36	---	---
LLG Gnd Return kA:	2.147	LLG:	2.72	1.3	---	---	---				
TK71 MCC	480	3 Phase:	2.91	2.4	1.02	2.92	2.91	Z1:	41.34	0.07	0.07
		SLG:	2.47	1.2	1.03	2.48	---	Z2:	41.34	---	---
		LL:	2.52	1.2	---	---	---	Z0:	63.36	---	---
LLG Gnd Return kA:	2.147	LLG:	2.72	1.3	---	---	---				
TK72 MAIN BK Line Side	480	3 Phase:	2.77	2.3	0.79	2.77	2.77	Z1:	43.39	0.08	0.06
		SLG:	2.37	1.1	0.76	2.37	---	Z2:	43.39	---	---
		LL:	2.40	1.2	---	---	---	Z0:	65.50	---	---
LLG Gnd Return kA:	2.069	LLG:	2.63	1.3	---	---	---				
TK72 MCC	480	3 Phase:	2.77	2.3	0.79	2.77	2.77	Z1:	43.39	0.08	0.06
		SLG:	2.37	1.1	0.76	2.37	---	Z2:	43.39	---	---
		LL:	2.40	1.2	---	---	---	Z0:	65.50	---	---
LLG Gnd Return kA:	2.069	LLG:	2.63	1.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TK73 MAIN BK Line Side	480	3 Phase:	2.83	2.4	1.43	2.86	2.85	Z1:	42.53	0.06	0.08
		SLG:	2.33	1.1	1.51	2.36	---	Z2:	42.53	---	---
		LL:	2.45	1.2	---	---	---	Z0:	70.07	---	---
LLG Gnd Return kA:	1.976	LLG:	2.59	1.2	---	---	---				
TK73 MCC	480	3 Phase:	2.83	2.4	1.43	2.86	2.85	Z1:	42.53	0.06	0.08
		SLG:	2.33	1.1	1.51	2.36	---	Z2:	42.53	---	---
		LL:	2.45	1.2	---	---	---	Z0:	70.07	---	---
LLG Gnd Return kA:	1.976	LLG:	2.59	1.2	---	---	---				
TK74 MAIN BK Line Side	480	3 Phase:	2.32	1.9	0.88	2.32	2.32	Z1:	51.89	0.09	0.08
		SLG:	1.92	0.9	0.92	1.93	---	Z2:	51.89	---	---
		LL:	2.01	1.0	---	---	---	Z0:	83.77	---	---
LLG Gnd Return kA:	1.645	LLG:	2.14	1.0	---	---	---				
TK74 MCC	480	3 Phase:	2.32	1.9	0.88	2.32	2.32	Z1:	51.89	0.09	0.08
		SLG:	1.92	0.9	0.92	1.93	---	Z2:	51.89	---	---
		LL:	2.01	1.0	---	---	---	Z0:	83.77	---	---
LLG Gnd Return kA:	1.645	LLG:	2.14	1.0	---	---	---				
TK81 MAIN BK Line Side	480	3 Phase:	2.91	2.4	0.80	2.92	2.92	Z1:	41.27	0.07	0.06
		SLG:	2.52	1.2	0.78	2.52	---	Z2:	41.27	---	---
		LL:	2.52	1.2	---	---	---	Z0:	60.81	---	---
LLG Gnd Return kA:	2.215	LLG:	2.77	1.3	---	---	---				
TK81 MCC	480	3 Phase:	2.91	2.4	0.80	2.92	2.92	Z1:	41.27	0.07	0.06
		SLG:	2.52	1.2	0.78	2.52	---	Z2:	41.27	---	---
		LL:	2.52	1.2	---	---	---	Z0:	60.81	---	---
LLG Gnd Return kA:	2.215	LLG:	2.77	1.3	---	---	---				
TK82 MAIN BK Line Side	480	3 Phase:	3.14	2.6	0.83	3.14	3.14	Z1:	38.26	0.07	0.06
		SLG:	2.72	1.3	0.79	2.72	---	Z2:	38.26	---	---
		LL:	2.72	1.3	---	---	---	Z0:	55.98	---	---
LLG Gnd Return kA:	2.402	LLG:	3.01	1.4	---	---	---				
TK82 MCC	480	3 Phase:	3.14	2.6	0.83	3.14	3.14	Z1:	38.26	0.07	0.06
		SLG:	2.72	1.3	0.79	2.72	---	Z2:	38.26	---	---
		LL:	2.72	1.3	---	---	---	Z0:	55.98	---	---
LLG Gnd Return kA:	2.402	LLG:	3.01	1.4	---	---	---				
TK83 MAIN BK Line side	480	3 Phase:	3.94	3.3	0.82	3.94	3.94	Z1:	30.53	0.05	0.04
		SLG:	3.57	1.7	0.73	3.57	---	Z2:	30.53	---	---
		LL:	3.41	1.6	---	---	---	Z0:	40.32	---	---
LLG Gnd Return kA:	3.253	LLG:	3.93	1.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TK83 MCC	480	3 Phase:	3.94	3.3	0.82	3.94	3.94	Z1:	30.53	0.05	0.04
		SLG:	3.57	1.7	0.73	3.57	---	Z2:	30.53	---	---
		LL:	3.41	1.6	---	---	---	Z0:	40.32	---	---
LLG Gnd Return kA:	3.253	LLG:	3.93	1.9	---	---	---				
TK84 MAIN BK Line Side	480	3 Phase:	4.78	4.0	1.00	4.79	4.78	Z1:	25.16	0.04	0.04
		SLG:	4.45	2.1	0.86	4.45	---	Z2:	25.16	---	---
		LL:	4.14	2.0	---	---	---	Z0:	31.15	---	---
LLG Gnd Return kA:	4.142	LLG:	4.88	2.3	---	---	---				
TK84 MCC	480	3 Phase:	4.78	4.0	1.00	4.79	4.78	Z1:	25.16	0.04	0.04
		SLG:	4.45	2.1	0.86	4.45	---	Z2:	25.16	---	---
		LL:	4.14	2.0	---	---	---	Z0:	31.15	---	---
LLG Gnd Return kA:	4.142	LLG:	4.88	2.3	---	---	---				
TK85 MAIN BK Line Side	480	3 Phase:	6.37	5.3	1.81	6.57	6.47	Z1:	18.87	0.02	0.04
		SLG:	6.52	3.1	1.56	6.63	---	Z2:	18.87	---	---
		LL:	5.52	2.6	---	---	---	Z0:	17.85	---	---
LLG Gnd Return kA:	6.643	LLG:	6.81	3.3	---	---	---				
TK85 MCC	480	3 Phase:	6.37	5.3	1.81	6.57	6.47	Z1:	18.87	0.02	0.04
		SLG:	6.52	3.1	1.56	6.63	---	Z2:	18.87	---	---
		LL:	5.52	2.6	---	---	---	Z0:	17.85	---	---
LLG Gnd Return kA:	6.643	LLG:	6.81	3.3	---	---	---				
TK86 MAIN BK Line Side	480	3 Phase:	3.70	3.1	0.78	3.71	3.71	Z1:	32.47	0.06	0.04
		SLG:	3.30	1.6	0.67	3.30	---	Z2:	32.47	---	---
		LL:	3.21	1.5	---	---	---	Z0:	44.61	---	---
LLG Gnd Return kA:	2.971	LLG:	3.67	1.8	---	---	---				
TK86 MCC	480	3 Phase:	3.70	3.1	0.78	3.71	3.71	Z1:	32.47	0.06	0.04
		SLG:	3.30	1.6	0.67	3.30	---	Z2:	32.47	---	---
		LL:	3.21	1.5	---	---	---	Z0:	44.61	---	---
LLG Gnd Return kA:	2.971	LLG:	3.67	1.8	---	---	---				
TK87 MAIN BK Line Side	480	3 Phase:	2.83	2.4	1.01	2.83	2.83	Z1:	42.52	0.07	0.07
		SLG:	2.40	1.1	1.02	2.40	---	Z2:	42.52	---	---
		LL:	2.45	1.2	---	---	---	Z0:	65.63	---	---
LLG Gnd Return kA:	2.077	LLG:	2.64	1.3	---	---	---				
TK87 MCC	480	3 Phase:	2.83	2.4	1.01	2.83	2.83	Z1:	42.52	0.07	0.07
		SLG:	2.40	1.1	1.02	2.40	---	Z2:	42.52	---	---
		LL:	2.45	1.2	---	---	---	Z0:	65.63	---	---
LLG Gnd Return kA:	2.077	LLG:	2.64	1.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TK90/88 MAIN BK Line Side	480	3 Phase:	4.93	4.1	1.55	5.01	4.97	Z1:	24.42	0.03	0.05
		SLG:	4.54	2.2	1.41	4.59	---	Z2:	24.42	---	---
		LL:	4.27	2.0	---	---	---	Z0:	30.70	---	---
LLG Gnd Return kA:	4.208	LLG:	4.88	2.3	---	---	---				
TK90/88 MCC	480	3 Phase:	4.93	4.1	1.55	5.01	4.97	Z1:	24.42	0.03	0.05
		SLG:	4.54	2.2	1.41	4.59	---	Z2:	24.42	---	---
		LL:	4.27	2.0	---	---	---	Z0:	30.70	---	---
LLG Gnd Return kA:	4.208	LLG:	4.88	2.3	---	---	---				
TX-A Prim Side	12,470	3 Phase:	2.28	49.3	6.35	3.01	2.66	Z1:	2.03	0.54	3.11
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.03	---	---
		LL:	1.98	24.6	---	---	---	Z0:	926.18	---	---
LLG Gnd Return kA:	0.007	LLG:	1.98	24.7	---	---	---				
TX-A Sec Side	480	3 Phase:	14.93	12.4	5.54	19.14	17.10	Z1:	8.06	0.00	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	8.06	---	---
		LL:	12.93	6.2	---	---	---	Z0:	180,033.20	---	---
LLG Gnd Return kA:	0.001	LLG:	12.93	6.2	---	---	---				
TX-B Prim Side	12,470	3 Phase:	2.28	49.4	6.52	3.03	2.67	Z1:	2.03	0.52	3.11
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.03	---	---
		LL:	1.98	24.7	---	---	---	Z0:	926.17	---	---
LLG Gnd Return kA:	0.007	LLG:	1.98	24.7	---	---	---				
TX-B Sec Side	480	3 Phase:	14.28	11.9	5.89	18.56	16.50	Z1:	8.42	0.00	0.02
		SLG:	0.00	0.0	0.02	0.00	---	Z2:	8.42	---	---
		LL:	12.37	5.9	---	---	---	Z0:	182,360.20	---	---
LLG Gnd Return kA:	0.001	LLG:	12.37	5.9	---	---	---				
TX-E Prim Side	12,470	3 Phase:	2.22	47.8	4.44	2.70	2.46	Z1:	2.09	0.76	3.16
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.09	---	---
		LL:	1.92	23.9	---	---	---	Z0:	926.41	---	---
LLG Gnd Return kA:	0.007	LLG:	1.92	24.0	---	---	---				
TX-E Sec Side	480	3 Phase:	10.75	8.9	4.69	13.27	12.04	Z1:	11.19	0.01	0.03
		SLG:	11.43	5.5	4.69	14.11	---	Z2:	11.19	---	---
		LL:	9.31	4.5	---	---	---	Z0:	9.20	---	---
LLG Gnd Return kA:	12.195	LLG:	11.12	5.3	---	---	---				
TX-F Prim Side	12,470	3 Phase:	2.28	49.2	6.25	3.00	2.65	Z1:	2.03	0.55	3.11
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.03	---	---
		LL:	1.97	24.6	---	---	---	Z0:	926.20	---	---
LLG Gnd Return kA:	0.007	LLG:	1.98	24.6	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TX-F Sec Side	4,160	3 Phase:	2.76	19.9	7.97	3.81	3.31	Z1:	5.03	0.13	0.86
		SLG:	3.04	12.6	7.53	4.15	---	Z2:	5.03	---	---
		LL:	2.39	9.9	---	---	---	Z0:	3.65	---	---
LLG Gnd Return kA:	3.375	LLG:	2.93	12.2	---	---	---				

Momentary 3 Phase

Fault Location Bus Name	Bus Voltage	-----Sym Fault Duty----- kA	MVA	X/R	---------Mom kA--------- Sym*1.6	Based on X/R	--------Crest kA-------- Sym*2.7	Based on X/R	Equivalent R	+jX
02-MAIN SERVICE SWGR	12,470	1.990	42.98	6.67	3.184	2.650	5.373	4.570	0.58	3.57
5KV SWGR	4,160	2.567	18.50	7.69	4.107	3.520	6.931	6.040	0.14	0.92
BB-ESB1-TXR1 Prim Side	12,470	1.990	42.99	6.61	3.184	2.650	5.374	4.560	0.58	3.57
BB-ESB2-TXR1 Prim Side	12,470	1.990	42.99	6.61	3.184	2.650	5.374	4.560	0.58	3.57
BB-ESB3-TXR1 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
BB-ESB4-TXR1 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
BB-ESB5-TXR1 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
SUB1 12.5 kV Line Side	12,470	3.303	71.33	5.07	5.284	4.150	8.917	7.180	0.44	2.13
SUB1 Xmer Prim Side	12,470	3.302	71.33	5.07	5.284	4.150	8.917	7.180	0.44	2.13
SUB1 Xmer Sec Side	12,470	1.994	43.08	6.86	3.191	2.680	5.385	4.610	0.56	3.57
SUB1-PDC1	12,470	1.993	43.05	6.83	3.189	2.670	5.382	4.600	0.56	3.57
SUB2 12.5 kV Line Side	12,470	2.352	50.80	2.45	3.763	2.530	6.350	4.250	1.16	2.83
SUB2 Xmer Prim Side	12,470	2.352	50.80	2.45	3.763	2.530	6.350	4.250	1.16	2.83
SUB2 Xmer Sec Side	4,160	1.911	13.77	4.57	3.058	2.350	5.160	4.060	0.27	1.23
SUB2-PDC1	4,160	1.904	13.72	4.48	3.046	2.320	5.140	4.030	0.28	1.23
T-3 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
T-4 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
TX-A Prim Side	12,470	1.986	42.89	6.44	3.177	2.630	5.361	4.530	0.60	3.58
TX-B Prim Side	12,470	1.989	42.95	6.60	3.182	2.650	5.369	4.560	0.59	3.57
TX-E Prim Side	12,470	1.936	41.82	4.66	3.098	2.390	5.228	4.130	0.82	3.63
TX-F Prim Side	12,470	1.983	42.82	6.35	3.172	2.620	5.353	4.510	0.61	3.58
TX-F Sec Side	4,160	2.576	18.56	7.81	4.121	3.550	6.955	6.080	0.14	0.92

Momentary Unbalanced

Fault Location Bus Name	Bus Voltage		---Sym Fault Duty--- kA	MVA	X/R	--Mom. Fault Duty-- kA*1.6	Based on X/R	Sequence Impedance pu	
02-MAIN SERVICE SWGR	12,470	3 Phase:	1.990	42.98	6.67	3.184	2.650	Z1:	2.33
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.33
		LL:	1.723	21.49	---	---	---	Z0:	926.16
LLG Gnd Return kA:	0.01	LLG:	1.727	21.53	---	---	---		
5KV SWGR	4,160	3 Phase:	2.567	18.50	7.69	4.107	3.520	Z1:	5.41
		SLG:	2.867	11.93	7.20	4.587	3.880	Z2:	5.41
		LL:	2.223	9.25	---	---	---	Z0:	3.71
LLG Gnd Return kA:	3.25	LLG:	2.761	11.49	---	---	---		
BB-ESB1-TXR1 Prim Side	12,470	3 Phase:	1.990	42.99	6.61	3.184	2.650	Z1:	2.33
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.33
		LL:	1.724	21.49	---	---	---	Z0:	926.16
LLG Gnd Return kA:	0.01	LLG:	1.727	21.54	---	---	---		
BB-ESB2-TXR1 Prim Side	12,470	3 Phase:	1.990	42.99	6.61	3.184	2.650	Z1:	2.33
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.33
		LL:	1.724	21.49	---	---	---	Z0:	926.16
LLG Gnd Return kA:	0.01	LLG:	1.727	21.54	---	---	---		
BB-ESB3-TXR1 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
BB-ESB4-TXR1 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
BB-ESB5-TXR1 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
SUB1 12.5 kV Line Side	12,470	3 Phase:	3.303	71.33	5.07	5.284	4.150	Z1:	1.40
		SLG:	2.256	28.13	4.00	3.609	2.680	Z2:	1.40
		LL:	2.860	35.67	---	---	---	Z0:	3.36
LLG Gnd Return kA:	1.71	LLG:	3.040	37.91	---	---	---		
SUB1 Xmer Prim Side	12,470	3 Phase:	3.302	71.33	5.07	5.284	4.150	Z1:	1.40
		SLG:	2.256	28.13	4.00	3.609	2.680	Z2:	1.40
		LL:	2.860	35.66	---	---	---	Z0:	3.36
LLG Gnd Return kA:	1.71	LLG:	3.040	37.91	---	---	---		
SUB1 Xmer Sec Side	12,470	3 Phase:	1.994	43.08	6.86	3.191	2.680	Z1:	2.32
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.32
		LL:	1.727	21.54	---	---	---	Z0:	926.11
LLG Gnd Return kA:	0.01	LLG:	1.731	21.58	---	---	---		
SUB1-PDC1	12,470	3 Phase:	1.993	43.05	6.83	3.189	2.670	Z1:	2.32
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.32
		LL:	1.726	21.53	---	---	---	Z0:	926.13
LLG Gnd Return kA:	0.01	LLG:	1.730	21.57	---	---	---		

Momentary Unbalanced

Fault Location Bus Name	Bus Voltage		---Sym Fault Duty--- kA	MVA	X/R	--Mom. Fault Duty-- kA*1.6	Based on X/R	Sequence Impedance pu	
SUB2 12.5 kV Line Side	12,470	3 Phase:	2.352	50.80	2.45	3.763	2.530	Z1:	1.97
		SLG:	1.639	20.44	1.86	2.622	1.690	Z2:	1.97
		LL:	2.037	25.40	---	---	---	Z0:	4.58
LLG Gnd Return kA:	1.25	LLG:	2.226	27.76	---	---	---		
SUB2 Xmer Prim Side	12,470	3 Phase:	2.352	50.80	2.45	3.763	2.530	Z1:	1.97
		SLG:	1.639	20.44	1.85	2.622	1.690	Z2:	1.97
		LL:	2.037	25.40	---	---	---	Z0:	4.58
LLG Gnd Return kA:	1.25	LLG:	2.226	27.76	---	---	---		
SUB2 Xmer Sec Side	4,160	3 Phase:	1.911	13.77	4.57	3.058	2.350	Z1:	7.26
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.26
		LL:	1.655	6.89	---	---	---	Z0:	2,776.53
LLG Gnd Return kA:	0.01	LLG:	1.659	6.90	---	---	---		
SUB2-PDC1	4,160	3 Phase:	1.904	13.72	4.48	3.046	2.320	Z1:	7.29
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.29
		LL:	1.649	6.86	---	---	---	Z0:	2,776.68
LLG Gnd Return kA:	0.01	LLG:	1.652	6.87	---	---	---		
T-3 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
T-4 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
TX-A Prim Side	12,470	3 Phase:	1.986	42.89	6.44	3.177	2.630	Z1:	2.33
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.33
		LL:	1.720	21.44	---	---	---	Z0:	926.18
LLG Gnd Return kA:	0.01	LLG:	1.723	21.49	---	---	---		
TX-B Prim Side	12,470	3 Phase:	1.989	42.95	6.60	3.182	2.650	Z1:	2.33
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.33
		LL:	1.722	21.48	---	---	---	Z0:	926.17
LLG Gnd Return kA:	0.01	LLG:	1.726	21.52	---	---	---		
TX-E Prim Side	12,470	3 Phase:	1.936	41.82	4.66	3.098	2.390	Z1:	2.39
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.39
		LL:	1.677	20.91	---	---	---	Z0:	926.41
LLG Gnd Return kA:	0.01	LLG:	1.680	20.96	---	---	---		
TX-F Prim Side	12,470	3 Phase:	1.983	42.82	6.35	3.172	2.620	Z1:	2.34
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.34
		LL:	1.717	21.41	---	---	---	Z0:	926.20
LLG Gnd Return kA:	0.01	LLG:	1.721	21.46	---	---	---		
TX-F Sec Side	4,160	3 Phase:	2.576	18.56	7.81	4.121	3.550	Z1:	5.39
		SLG:	2.885	12.00	7.44	4.617	3.930	Z2:	5.39
		LL:	2.231	9.28	---	---	---	Z0:	3.65
LLG Gnd Return kA:	3.28	LLG:	2.771	11.53	---	---	---		

Interrupting 3 Phase and Unbalanced

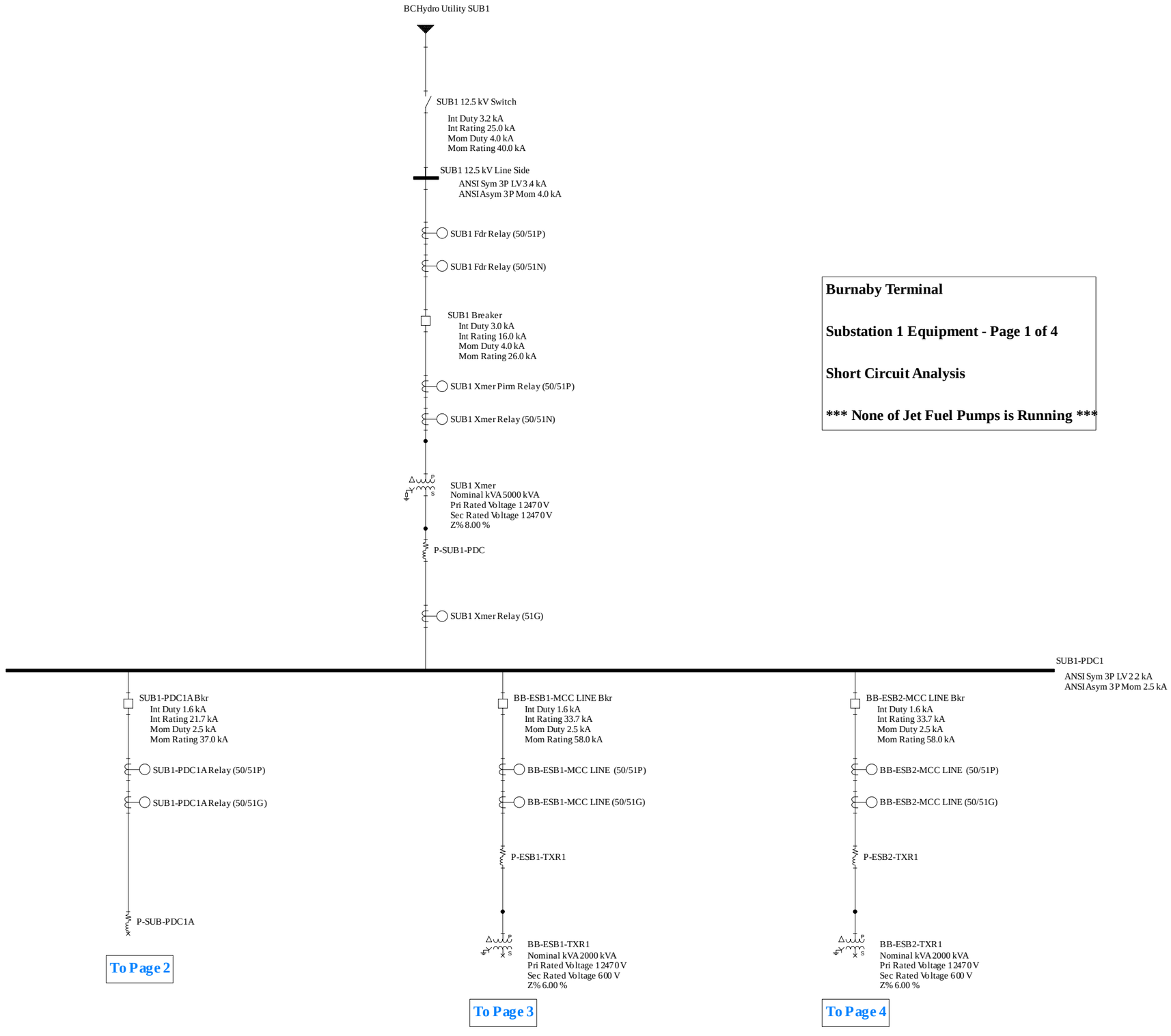
Fault Location Bus Name	Bus Voltage		-----Init Sym Fault----- kA	X/R	Equivalent R	+jX	Seq. Imp. pu		-------Interrupting Fault kA----- 2 cyc.	3 cyc.	5 cyc.	8 cyc.
02-MAIN SERVICE SWGR	12,470	3 Phase:	1.68	6.68	0.66	4.24	Z1: 2.76	3Ph.Sym:	1.68	1.68	1.68	1.68
		SLG:	0.01	0.01	---	---	Z2: 2.76	Tot:	1.85	1.68	1.68	1.68
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.45	---	---	---		Tot:	0.01	0.01	0.01	0.01
5KV SWGR	4,160	3 Phase:	2.25	6.90	0.17	1.05	Z1: 6.17	3Ph.Sym:	2.25	2.25	2.25	2.25
		SLG:	2.60	6.69	---	---	Z2: 6.17	Tot:	2.50	2.27	2.25	2.25
NACD:	0.83	LL:	1.95	---	---	---	Z0: 3.71	SLG Sym:	2.60	2.60	2.60	2.60
LLG Gnd Return kA:	3.065	LLG:	2.48	---	---	---		Tot:	2.86	2.61	2.60	2.60
BB-ESB1-TXR1 Prim Side	12,470	3 Phase:	1.68	6.65	0.66	4.24	Z1: 2.76	3Ph.Sym:	1.68	1.68	1.68	1.68
		SLG:	0.01	0.01	---	---	Z2: 2.76	Tot:	1.84	1.68	1.68	1.68
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.46	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB2-TXR1 Prim Side	12,470	3 Phase:	1.68	6.65	0.66	4.24	Z1: 2.76	3Ph.Sym:	1.68	1.68	1.68	1.68
		SLG:	0.01	0.01	---	---	Z2: 2.76	Tot:	1.84	1.68	1.68	1.68
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.46	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB3-TXR1 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB4-TXR1 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB5-TXR1 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
SUB1 12.5 kV Line Side	12,470	3 Phase:	3.06	4.88	0.49	2.30	Z1: 1.51	3Ph.Sym:	3.06	3.06	3.06	3.06
		SLG:	2.18	3.97	---	---	Z2: 1.51	Tot:	3.21	3.06	3.06	3.06
NACD:	0.93	LL:	2.65	---	---	---	Z0: 3.36	SLG Sym:	2.18	2.18	2.18	2.18
LLG Gnd Return kA:	1.688	LLG:	2.83	---	---	---		Tot:	2.26	2.18	2.18	2.18
SUB1 Xmer Prim Side	12,470	3 Phase:	3.06	4.88	0.49	2.30	Z1: 1.51	3Ph.Sym:	3.06	3.06	3.06	3.06
		SLG:	2.18	3.97	---	---	Z2: 1.51	Tot:	3.21	3.06	3.06	3.06
NACD:	0.93	LL:	2.65	---	---	---	Z0: 3.36	SLG Sym:	2.18	2.18	2.18	2.18
LLG Gnd Return kA:	1.688	LLG:	2.83	---	---	---		Tot:	2.26	2.18	2.18	2.18
SUB1 Xmer Sec Side	12,470	3 Phase:	1.68	6.90	0.64	4.24	Z1: 2.76	3Ph.Sym:	1.68	1.68	1.68	1.68
		SLG:	0.01	0.01	---	---	Z2: 2.76	Tot:	1.86	1.69	1.68	1.68
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.46	---	---	---		Tot:	0.01	0.01	0.01	0.01

Interrupting 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		-----Init Sym Fault----- kA	X/R	Equivalent R	+jX	Seq. Imp. pu		-------Interrupting Fault kA----- 2 cyc.	3 cyc.	5 cyc.	8 cyc.
SUB1-PDC1	12,470	3 Phase:	1.68	6.85	0.64	4.24	Z1: 2.76	3Ph.Sym:	1.68	1.68	1.68	1.68
		SLG:	0.01	0.01	---	---	Z2: 2.76	Tot:	1.86	1.69	1.68	1.68
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.46	---	---	---		Tot:	0.01	0.01	0.01	0.01
SUB2 12.5 kV Line Side	12,470	3 Phase:	2.35	2.45	1.16	2.83	Z1: 1.97	3Ph.Sym:	2.35	2.35	2.35	2.35
		SLG:	1.64	1.86	---	---	Z2: 1.97	Tot:	2.40	2.35	2.35	2.35
NACD:	1.00	LL:	2.04	---	---	---	Z0: 4.58	SLG Sym:	1.64	1.64	1.64	1.64
LLG Gnd Return kA:	1.252	LLG:	2.23	---	---	---		Tot:	1.66	1.64	1.64	1.64
SUB2 Xmer Prim Side	12,470	3 Phase:	2.35	2.45	1.16	2.83	Z1: 1.97	3Ph.Sym:	2.35	2.35	2.35	2.35
		SLG:	1.64	1.85	---	---	Z2: 1.97	Tot:	2.40	2.35	2.35	2.35
NACD:	1.00	LL:	2.04	---	---	---	Z0: 4.58	SLG Sym:	1.64	1.64	1.64	1.64
LLG Gnd Return kA:	1.252	LLG:	2.23	---	---	---		Tot:	1.66	1.64	1.64	1.64
SUB2 Xmer Sec Side	4,160	3 Phase:	1.91	4.57	0.27	1.23	Z1: 7.26	3Ph.Sym:	1.91	1.91	1.91	1.91
		SLG:	0.01	0.01	---	---	Z2: 7.26	Tot:	2.00	1.91	1.91	1.91
NACD:	1.00	LL:	1.66	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.66	---	---	---		Tot:	0.01	0.01	0.01	0.01
SUB2-PDC1	4,160	3 Phase:	1.90	4.48	0.28	1.23	Z1: 7.29	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.29	Tot:	1.99	1.90	1.90	1.90
NACD:	1.00	LL:	1.65	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
T-3 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
T-4 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-A Prim Side	12,470	3 Phase:	1.67	6.48	0.68	4.25	Z1: 2.77	3Ph.Sym:	1.67	1.67	1.67	1.67
		SLG:	0.01	0.01	---	---	Z2: 2.77	Tot:	1.83	1.68	1.67	1.67
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.45	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-B Prim Side	12,470	3 Phase:	1.67	6.62	0.67	4.25	Z1: 2.76	3Ph.Sym:	1.67	1.67	1.67	1.67
		SLG:	0.01	0.01	---	---	Z2: 2.76	Tot:	1.84	1.68	1.67	1.67
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.45	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-E Prim Side	12,470	3 Phase:	1.64	4.90	0.91	4.30	Z1: 2.83	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.83	Tot:	1.71	1.64	1.64	1.64
NACD:	0.85	LL:	1.42	---	---	---	Z0: 926.4	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01

Interrupting 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		-----Init Sym Fault----- kA	X/R	Equivalent R	+jX	Seq. Imp. pu		-------Interrupting Fault kA----- 2 cyc.	3 cyc.	5 cyc.	8 cyc.
TX-F Prim Side	12,470	3 Phase:	1.67	6.37	0.70	4.25	Z1: 2.77	3Ph.Sym:	1.67	1.67	1.67	1.67
		SLG:	0.01	0.01	---	---	Z2: 2.77	Tot:	1.82	1.67	1.67	1.67
NACD:	0.85	LL:	1.45	---	---	---	Z0: 926.2(	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.45	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-F Sec Side	4,160	3 Phase:	2.26	7.05	0.16	1.05	Z1: 6.14	3Ph.Sym:	2.26	2.26	2.26	2.26
		SLG:	2.61	6.93	---	---	Z2: 6.14	Tot:	2.52	2.28	2.26	2.26
NACD:	0.83	LL:	1.96	---	---	---	Z0: 3.65	SLG Sym:	2.61	2.61	2.61	2.61
LLG Gnd Return kA:	3.095	LLG:	2.49	---	---	---		Tot:	2.90	2.64	2.61	2.61



Burnaby Terminal

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Short Circuit Analysis

***** None of Jet Fuel Pumps is Running *****

Burnaby Terminal

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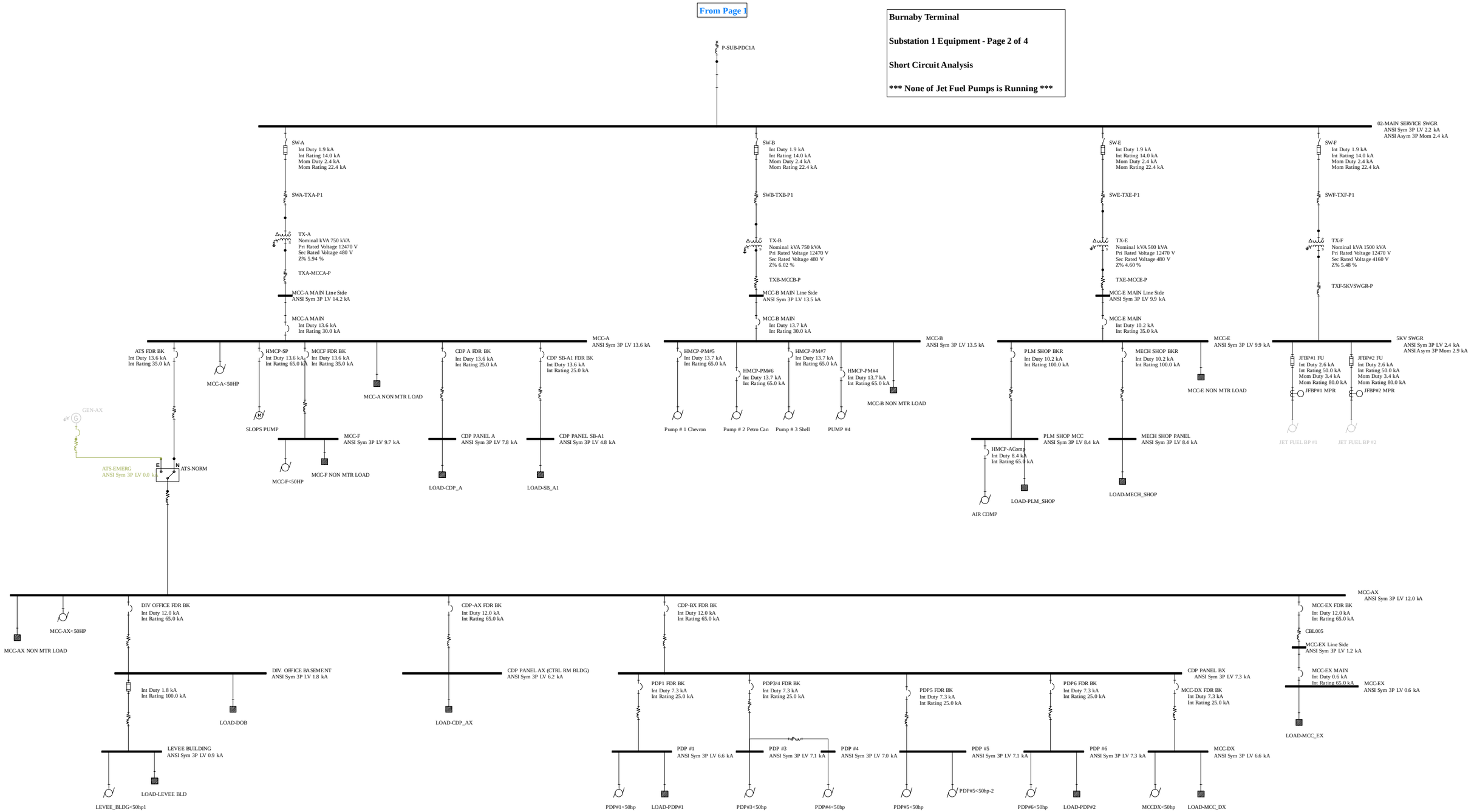
Short Circuit Analysis

***** None of Jet Fuel Pumps is Running *****



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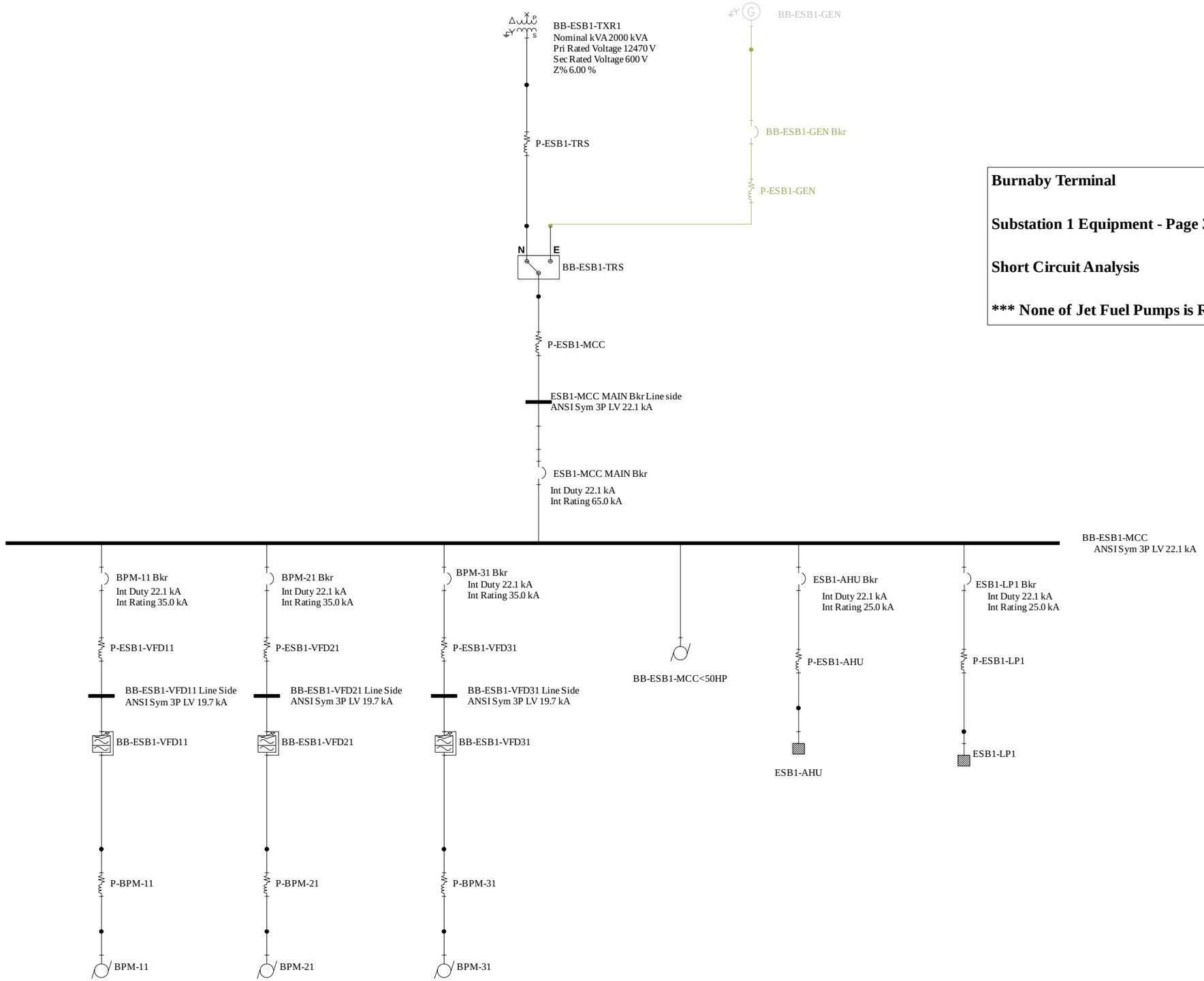

Burnaby Terminal

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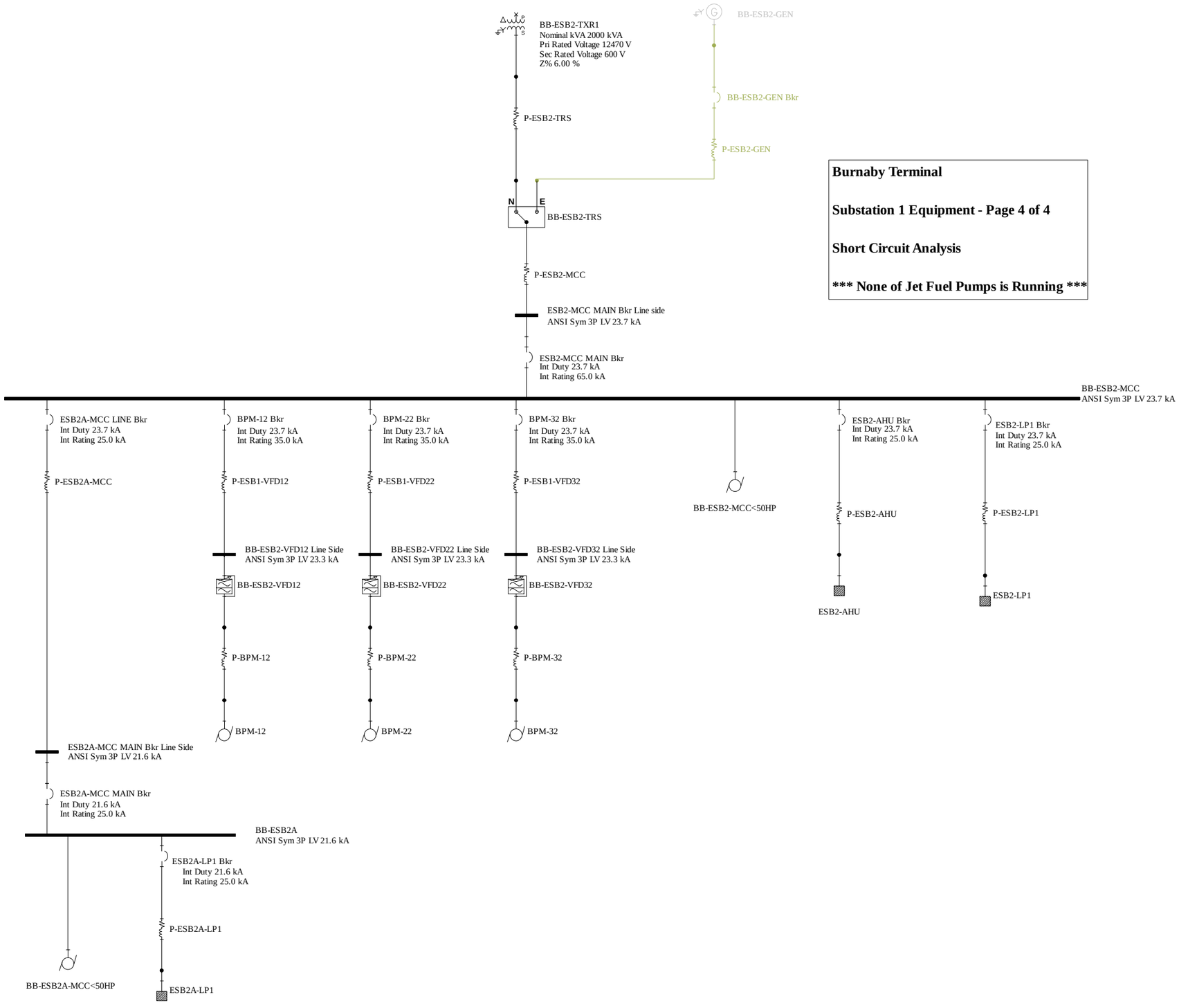
Short Circuit Analysis

***** None of Jet Fuel Pumps is Running *****

From Page 1



Burnaby Terminal

Substation 1 Equipment - Page 4 of 4

Short Circuit Analysis

***** None of Jet Fuel Pumps is Running *****

Project: Burnaby Terminal
Kinder Morgan
Burnaby Terminal
Power System Study

ANSI Complete Fault Report
None of Jet Fuel Pumps is Running

A_FAULT Settings

Fault Type	3 Phase+Unbalanced	**LV Duty**	Yes	**Int Duty**	Yes
Faulted Bus	All Buses	**LV Report**	Complete	**Int Report**	Complete
Include Tap	No	**Mom Duty**	Yes	**Solution Method**	E/Z
Pre-fault Voltage	1.0000	**Mom Report**	Complete	**NACD Option**	Interpolated

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
02-MAIN SERVICE SWGR	12,470	3 Phase:	2.18	47.0	6.09	2.85	2.52	Z1:	2.13	0.56	3.26
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.13	---	---
		LL:	1.88	23.5	---	---	---	Z0:	926.16	---	---
LLG Gnd Return kA:	0.007	LLG:	1.89	23.5	---	---	---				
5KV SWGR	4,160	3 Phase:	2.39	17.2	6.03	3.12	2.77	Z1:	5.81	0.17	0.99
		SLG:	2.71	11.3	6.04	3.55	---	Z2:	5.81	---	---
		LL:	2.07	8.6	---	---	---	Z0:	3.71	---	---
LLG Gnd Return kA:	3.147	LLG:	2.60	10.8	---	---	---				
BB-ESB1-MCC	600	3 Phase:	22.74	23.6	4.58	27.92	25.40	Z1:	4.23	0.00	0.01
		SLG:	20.26	12.2	2.17	21.35	---	Z2:	4.23	---	---
		LL:	19.69	11.8	---	---	---	Z0:	6.23	---	---
LLG Gnd Return kA:	17.705	LLG:	24.38	14.6	---	---	---				
BB-ESB1-TXR1 Prim Side	12,470	3 Phase:	2.18	47.0	6.09	2.85	2.53	Z1:	2.13	0.56	3.26
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.13	---	---
		LL:	1.89	23.5	---	---	---	Z0:	926.16	---	---
LLG Gnd Return kA:	0.007	LLG:	1.89	23.6	---	---	---				
BB-ESB1-TXR1 Sec Side	600	3 Phase:	24.46	25.4	6.19	32.12	28.43	Z1:	3.93	0.00	0.01
		SLG:	26.56	15.9	6.46	35.20	---	Z2:	3.93	---	---
		LL:	21.18	12.7	---	---	---	Z0:	3.00	---	---
LLG Gnd Return kA:	29.062	LLG:	25.44	15.3	---	---	---				
BB-ESB1-VFD11 Line Side	600	3 Phase:	22.33	23.2	4.32	27.05	24.75	Z1:	4.31	0.00	0.02
		SLG:	19.50	11.7	2.02	20.34	---	Z2:	4.31	---	---
		LL:	19.34	11.6	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.719	LLG:	23.85	14.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
BB-ESB1-VFD21	600	3 Phase:	22.33	23.2	4.32	27.05	24.75	Z1:	4.31	0.00	0.02
Line Side		SLG:	19.50	11.7	2.02	20.34	---	Z2:	4.31	---	---
		LL:	19.34	11.6	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.719	LLG:	23.85	14.3	---	---	---				
BB-ESB1-VFD31	600	3 Phase:	22.33	23.2	4.32	27.05	24.75	Z1:	4.31	0.00	0.02
Line Side		SLG:	19.50	11.7	2.02	20.34	---	Z2:	4.31	---	---
		LL:	19.34	11.6	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.719	LLG:	23.85	14.3	---	---	---				
BB-ESB2A	600	3 Phase:	21.64	22.5	3.31	24.66	23.18	Z1:	4.45	0.01	0.02
		SLG:	17.22	10.3	1.51	17.49	---	Z2:	4.45	---	---
		LL:	18.74	11.2	---	---	---	Z0:	8.49	---	---
LLG Gnd Return kA:	13.789	LLG:	22.49	13.5	---	---	---				
BB-ESB2-MCC	600	3 Phase:	23.81	24.7	4.74	29.46	26.71	Z1:	4.04	0.00	0.01
		SLG:	20.82	12.5	2.15	21.92	---	Z2:	4.04	---	---
		LL:	20.62	12.4	---	---	---	Z0:	6.23	---	---
LLG Gnd Return kA:	17.909	LLG:	25.38	15.2	---	---	---				
BB-ESB2-TXR1	12,470	3 Phase:	2.18	47.0	6.10	2.85	2.53	Z1:	2.13	0.56	3.26
Prim Side		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.13	---	---
		LL:	1.89	23.5	---	---	---	Z0:	926.16	---	---
LLG Gnd Return kA:	0.007	LLG:	1.89	23.6	---	---	---				
BB-ESB2-TXR1	600	3 Phase:	25.37	26.4	6.13	33.25	29.45	Z1:	3.79	0.00	0.01
Sec Side		SLG:	27.28	16.4	6.42	36.10	---	Z2:	3.79	---	---
		LL:	21.97	13.2	---	---	---	Z0:	3.00	---	---
LLG Gnd Return kA:	29.484	LLG:	26.19	15.7	---	---	---				
BB-ESB2-VFD12	600	3 Phase:	23.37	24.3	4.44	28.48	25.99	Z1:	4.12	0.00	0.01
Line Side		SLG:	20.01	12.0	2.00	20.86	---	Z2:	4.12	---	---
		LL:	20.23	12.1	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.898	LLG:	24.80	14.9	---	---	---				
BB-ESB2-VFD22	600	3 Phase:	23.37	24.3	4.44	28.48	25.99	Z1:	4.12	0.00	0.01
Line Side		SLG:	20.01	12.0	2.00	20.86	---	Z2:	4.12	---	---
		LL:	20.23	12.1	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.898	LLG:	24.80	14.9	---	---	---				
BB-ESB2-VFD32	600	3 Phase:	23.37	24.3	4.44	28.48	25.99	Z1:	4.12	0.00	0.01
Line Side		SLG:	20.01	12.0	2.00	20.86	---	Z2:	4.12	---	---
		LL:	20.23	12.1	---	---	---	Z0:	6.70	---	---
LLG Gnd Return kA:	16.898	LLG:	24.80	14.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
BB-ESB3A-MCC	600	3 Phase:	6.19	6.4	2.78	6.80	6.50	Z1:	15.55	0.02	0.05
		SLG:	5.72	3.4	1.72	5.87	---	Z2:	15.55	---	---
		LL:	5.36	3.2	---	---	---	Z0:	20.50	---	---
LLG Gnd Return kA:	5.200	LLG:	6.64	4.0	---	---	---				
BB-ESB3A-MCC Main Bkr LineSide	600	3 Phase:	6.48	6.7	3.28	7.37	6.93	Z1:	14.85	0.02	0.05
		SLG:	6.27	3.8	2.10	6.58	---	Z2:	14.85	---	---
		LL:	5.61	3.4	---	---	---	Z0:	17.15	---	---
LLG Gnd Return kA:	5.965	LLG:	7.02	4.2	---	---	---				
BB-ESB3B-MCC	600	3 Phase:	6.49	6.7	3.34	7.41	6.96	Z1:	14.83	0.02	0.05
		SLG:	6.27	3.8	2.12	6.59	---	Z2:	14.83	---	---
		LL:	5.62	3.4	---	---	---	Z0:	17.15	---	---
LLG Gnd Return kA:	5.968	LLG:	7.03	4.2	---	---	---				
BB-ESB3B-MCC Main Bkr LineSide	600	3 Phase:	6.49	6.7	3.34	7.41	6.96	Z1:	14.83	0.02	0.05
		SLG:	6.27	3.8	2.12	6.59	---	Z2:	14.83	---	---
		LL:	5.62	3.4	---	---	---	Z0:	17.15	---	---
LLG Gnd Return kA:	5.968	LLG:	7.03	4.2	---	---	---				
BB-ESB3-MCC	600	3 Phase:	6.78	7.0	4.12	8.12	7.47	Z1:	14.20	0.01	0.05
		SLG:	6.87	4.1	2.80	7.56	---	Z2:	14.20	---	---
		LL:	5.87	3.5	---	---	---	Z0:	14.06	---	---
LLG Gnd Return kA:	6.890	LLG:	7.37	4.4	---	---	---				
BB-ESB3-TXR1 Prim Side	4,160	3 Phase:	2.33	16.8	4.50	2.85	2.59	Z1:	5.96	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.96	---	---
		LL:	2.02	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
BB-ESB3-TXR1 Sec Side	600	3 Phase:	7.11	7.4	4.81	8.83	8.00	Z1:	13.53	0.01	0.05
		SLG:	7.79	4.7	4.78	9.66	---	Z2:	13.53	---	---
		LL:	6.16	3.7	---	---	---	Z0:	10.00	---	---
LLG Gnd Return kA:	8.610	LLG:	7.51	4.5	---	---	---				
BB-ESB4-MCC	600	3 Phase:	1.88	2.0	3.43	2.16	2.02	Z1:	51.20	0.07	0.17
		SLG:	1.72	1.0	2.13	1.81	---	Z2:	51.20	---	---
		LL:	1.63	1.0	---	---	---	Z0:	67.40	---	---
LLG Gnd Return kA:	1.566	LLG:	1.95	1.2	---	---	---				
BB-ESB4-TXR1 Prim Side	4,160	3 Phase:	2.33	16.8	4.48	2.84	2.59	Z1:	5.97	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.97	---	---
		LL:	2.01	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
BB-ESB4-TXR1 Sec Side	600	3 Phase:	2.02	2.1	4.06	2.42	2.22	Z1:	47.57	0.04	0.17
		SLG:	1.99	1.2	3.77	2.34	---	Z2:	47.57	---	---
		LL:	1.75	1.1	---	---	---	Z0:	50.00	---	---
LLG Gnd Return kA:	1.956	LLG:	2.02	1.2	---	---	---				
BB-ESB5A-MCC	600	3 Phase:	5.50	5.7	2.12	5.78	5.64	Z1:	17.50	0.03	0.05
		SLG:	4.42	2.7	1.06	4.43	---	Z2:	17.50	---	---
		LL:	4.76	2.9	---	---	---	Z0:	32.72	---	---
LLG Gnd Return kA:	3.564	LLG:	5.73	3.4	---	---	---				
BB-ESB5B-MCC	600	3 Phase:	5.54	5.8	2.27	5.87	5.71	Z1:	17.38	0.03	0.05
		SLG:	4.44	2.7	1.09	4.45	---	Z2:	17.38	---	---
		LL:	4.79	2.9	---	---	---	Z0:	32.72	---	---
LLG Gnd Return kA:	3.572	LLG:	5.77	3.5	---	---	---				
BB-ESB5C-MCC	600	3 Phase:	5.54	5.8	2.27	5.87	5.71	Z1:	17.38	0.03	0.05
		SLG:	4.44	2.7	1.09	4.45	---	Z2:	17.38	---	---
		LL:	4.79	2.9	---	---	---	Z0:	32.72	---	---
LLG Gnd Return kA:	3.572	LLG:	5.77	3.5	---	---	---				
BB-ESB5-MCC	600	3 Phase:	6.03	6.3	2.61	6.55	6.29	Z1:	15.96	0.03	0.05
		SLG:	5.22	3.1	1.28	5.26	---	Z2:	15.96	---	---
		LL:	5.22	3.1	---	---	---	Z0:	25.55	---	---
LLG Gnd Return kA:	4.425	LLG:	6.45	3.9	---	---	---				
BB-ESB5-TXR1 Prim Side	4,160	3 Phase:	2.33	16.8	4.50	2.85	2.59	Z1:	5.96	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.96	---	---
		LL:	2.02	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
BB-ESB5-TXR1 Sec Side	600	3 Phase:	7.15	7.4	4.52	8.75	7.97	Z1:	13.47	0.01	0.05
		SLG:	7.82	4.7	4.56	9.59	---	Z2:	13.47	---	---
		LL:	6.19	3.7	---	---	---	Z0:	10.00	---	---
LLG Gnd Return kA:	8.626	LLG:	7.51	4.5	---	---	---				
BB-LC3A-MCC	480	3 Phase:	6.86	5.7	2.44	7.36	7.11	Z1:	17.53	0.02	0.04
		SLG:	6.69	3.2	1.66	6.85	---	Z2:	17.53	---	---
		LL:	5.94	2.9	---	---	---	Z0:	19.89	---	---
LLG Gnd Return kA:	6.409	LLG:	7.50	3.6	---	---	---				
BB-LC4A-MCC	480	3 Phase:	5.84	4.9	1.85	6.04	5.94	Z1:	20.58	0.02	0.04
		SLG:	5.11	2.5	1.20	5.13	---	Z2:	20.58	---	---
		LL:	5.06	2.4	---	---	---	Z0:	31.14	---	---
LLG Gnd Return kA:	4.432	LLG:	6.14	2.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
CDP PANEL A	480	3 Phase:	7.85	6.5	1.27	7.91	7.88	Z1:	15.31	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	15.31	---	---
		LL:	6.80	3.3	---	---	---	Z0:	180,046.70	---	---
LLG Gnd Return kA:	0.001	LLG:	6.80	3.3	---	---	---				
CDP PANEL AX (CTRL RM BLDG)	480	3 Phase:	6.23	5.2	1.05	6.24	6.24	Z1:	19.31	0.03	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	19.31	---	---
		LL:	5.39	2.6	---	---	---	Z0:	180,053.80	---	---
LLG Gnd Return kA:	0.001	LLG:	5.39	2.6	---	---	---				
CDP PANEL BX	480	3 Phase:	7.36	6.1	2.58	7.98	7.67	Z1:	16.35	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.35	---	---
		LL:	6.37	3.1	---	---	---	Z0:	180,052.30	---	---
LLG Gnd Return kA:	0.001	LLG:	6.37	3.1	---	---	---				
CDP PANEL SB-A1	480	3 Phase:	4.79	4.0	0.57	4.79	4.79	Z1:	25.10	0.05	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	25.10	---	---
		LL:	4.15	2.0	---	---	---	Z0:	180,066.20	---	---
LLG Gnd Return kA:	0.001	LLG:	4.15	2.0	---	---	---				
DIV. OFFICE BASEMENT	480	3 Phase:	1.80	1.5	0.53	1.80	1.80	Z1:	66.82	0.14	0.07
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	66.82	---	---
		LL:	1.56	0.7	---	---	---	Z0:	180,128.50	---	---
LLG Gnd Return kA:	0.001	LLG:	1.56	0.7	---	---	---				
ESB2A-MCC MAIN Bkr Line	600	3 Phase:	21.64	22.5	3.31	24.66	23.18	Z1:	4.45	0.01	0.02
		SLG:	17.22	10.3	1.51	17.49	---	Z2:	4.45	---	---
		LL:	18.74	11.2	---	---	---	Z0:	8.49	---	---
LLG Gnd Return kA:	13.789	LLG:	22.49	13.5	---	---	---				
ESB2-MCC MAIN Bkr Line side	600	3 Phase:	23.81	24.7	4.74	29.46	26.72	Z1:	4.04	0.00	0.01
		SLG:	20.82	12.5	2.15	21.92	---	Z2:	4.04	---	---
		LL:	20.62	12.4	---	---	---	Z0:	6.23	---	---
LLG Gnd Return kA:	17.915	LLG:	25.38	15.2	---	---	---				
ESB3-MCC MAIN Bkr Line Side	600	3 Phase:	6.78	7.0	4.12	8.12	7.47	Z1:	14.20	0.01	0.05
		SLG:	6.87	4.1	2.80	7.56	---	Z2:	14.20	---	---
		LL:	5.87	3.5	---	---	---	Z0:	14.06	---	---
LLG Gnd Return kA:	6.890	LLG:	7.37	4.4	---	---	---				
ESB4-MCC MAIN Bkr Line Side	600	3 Phase:	1.88	2.0	3.43	2.16	2.02	Z1:	51.20	0.07	0.17
		SLG:	1.72	1.0	2.13	1.81	---	Z2:	51.20	---	---
		LL:	1.63	1.0	---	---	---	Z0:	67.36	---	---
LLG Gnd Return kA:	1.566	LLG:	1.95	1.2	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
ESB5A-MCC MAIN Bkr Line	600	3 Phase:	5.51	5.7	2.12	5.79	5.65	Z1:	17.47	0.03	0.05
		SLG:	4.43	2.7	1.07	4.44	---	Z2:	17.47	---	---
		LL:	4.77	2.9	---	---	---	Z0:	32.61	---	---
LLG Gnd Return kA:	3.575	LLG:	5.74	3.4	---	---	---				
ESB5B-MCC MAIN Bkr Line	600	3 Phase:	5.54	5.8	2.27	5.88	5.71	Z1:	17.36	0.03	0.05
		SLG:	4.45	2.7	1.09	4.47	---	Z2:	17.36	---	---
		LL:	4.80	2.9	---	---	---	Z0:	32.61	---	---
LLG Gnd Return kA:	3.583	LLG:	5.78	3.5	---	---	---				
ESB5C-MCC MAIN Bkr Line	600	3 Phase:	5.54	5.8	2.27	5.88	5.71	Z1:	17.36	0.03	0.05
		SLG:	4.45	2.7	1.09	4.47	---	Z2:	17.36	---	---
		LL:	4.80	2.9	---	---	---	Z0:	32.61	---	---
LLG Gnd Return kA:	3.583	LLG:	5.78	3.5	---	---	---				
ESB5-MCC MAIN Bkr Line Side	600	3 Phase:	6.03	6.3	2.61	6.55	6.29	Z1:	15.95	0.03	0.05
		SLG:	5.22	3.1	1.28	5.26	---	Z2:	15.95	---	---
		LL:	5.22	3.1	---	---	---	Z0:	25.53	---	---
LLG Gnd Return kA:	4.427	LLG:	6.45	3.9	---	---	---				
LC3A-MCC MAIN Bkr Line Side	480	3 Phase:	6.86	5.7	2.44	7.36	7.11	Z1:	17.53	0.02	0.04
		SLG:	6.69	3.2	1.66	6.85	---	Z2:	17.53	---	---
		LL:	5.94	2.9	---	---	---	Z0:	19.89	---	---
LLG Gnd Return kA:	6.409	LLG:	7.50	3.6	---	---	---				
LC4A-MCC MAIN Bkr Line Side	480	3 Phase:	6.69	5.6	2.48	7.20	6.95	Z1:	17.97	0.02	0.04
		SLG:	6.55	3.1	1.73	6.72	---	Z2:	17.97	---	---
		LL:	5.80	2.8	---	---	---	Z0:	20.06	---	---
LLG Gnd Return kA:	6.308	LLG:	7.28	3.5	---	---	---				
LEVEE BUILDING	480	3 Phase:	0.92	0.8	0.34	0.92	0.92	Z1:	130.60	0.29	0.09
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	130.60	---	---
		LL:	0.80	0.4	---	---	---	Z0:	180,234.30	---	---
LLG Gnd Return kA:	0.001	LLG:	0.80	0.4	---	---	---				
MCC LC-3	480	3 Phase:	7.86	6.5	4.44	9.58	8.74	Z1:	15.30	0.01	0.03
		SLG:	8.77	4.2	4.12	10.51	---	Z2:	15.30	---	---
		LL:	6.81	3.3	---	---	---	Z0:	10.53	---	---
LLG Gnd Return kA:	9.926	LLG:	8.56	4.1	---	---	---				
MCC LC-4	480	3 Phase:	7.63	6.3	4.41	9.29	8.48	Z1:	15.76	0.01	0.04
		SLG:	8.48	4.1	4.33	10.28	---	Z2:	15.76	---	---
		LL:	6.61	3.2	---	---	---	Z0:	11.03	---	---
LLG Gnd Return kA:	9.543	LLG:	8.17	3.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
MCC-A	480	3 Phase:	13.65	11.3	4.43	16.63	15.18	Z1:	8.81	0.00	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	8.81	---	---
		LL:	11.82	5.7	---	---	---	Z0:	180,034.80	---	---
LLG Gnd Return kA:	0.001	LLG:	11.82	5.7	---	---	---				
MCC-A MAIN Line Side	480	3 Phase:	14.20	11.8	4.79	17.61	15.95	Z1:	8.47	0.00	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	8.47	---	---
		LL:	12.30	5.9	---	---	---	Z0:	180,034.00	---	---
LLG Gnd Return kA:	0.001	LLG:	12.30	5.9	---	---	---				
MCC-AX	480	3 Phase:	12.06	10.0	2.97	13.44	12.76	Z1:	9.97	0.01	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	9.97	---	---
		LL:	10.45	5.0	---	---	---	Z0:	180,037.90	---	---
LLG Gnd Return kA:	0.001	LLG:	10.45	5.0	---	---	---				
MCC-B	480	3 Phase:	13.54	11.3	5.27	17.17	15.41	Z1:	8.88	0.00	0.02
		SLG:	0.00	0.0	0.02	0.00	---	Z2:	8.88	---	---
		LL:	11.73	5.6	---	---	---	Z0:	182,361.00	---	---
LLG Gnd Return kA:	0.001	LLG:	11.73	5.6	---	---	---				
MCC-B MAIN Line Side	480	3 Phase:	13.54	11.3	5.27	17.17	15.41	Z1:	8.88	0.00	0.02
		SLG:	0.00	0.0	0.02	0.00	---	Z2:	8.88	---	---
		LL:	11.73	5.6	---	---	---	Z0:	182,361.00	---	---
LLG Gnd Return kA:	0.001	LLG:	11.73	5.6	---	---	---				
MCC-DX	480	3 Phase:	6.64	5.5	2.27	7.05	6.85	Z1:	18.11	0.03	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	18.11	---	---
		LL:	5.75	2.8	---	---	---	Z0:	180,056.40	---	---
LLG Gnd Return kA:	0.001	LLG:	5.75	2.8	---	---	---				
MCC-E	480	3 Phase:	9.96	8.3	3.97	11.84	10.92	Z1:	12.07	0.01	0.03
		SLG:	10.22	4.9	3.90	12.09	---	Z2:	12.07	---	---
		LL:	8.63	4.1	---	---	---	Z0:	11.18	---	---
LLG Gnd Return kA:	10.480	LLG:	10.12	4.9	---	---	---				
MCC-E MAIN Line Side	480	3 Phase:	9.96	8.3	3.97	11.84	10.92	Z1:	12.07	0.01	0.03
		SLG:	10.22	4.9	3.90	12.09	---	Z2:	12.07	---	---
		LL:	8.63	4.1	---	---	---	Z0:	11.18	---	---
LLG Gnd Return kA:	10.480	LLG:	10.12	4.9	---	---	---				
MCC-EX	480	3 Phase:	0.63	0.5	0.40	0.63	0.63	Z1:	192.41	0.41	0.16
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	192.41	---	---
		LL:	0.54	0.3	---	---	---	Z0:	180,316.90	---	---
LLG Gnd Return kA:	0.001	LLG:	0.54	0.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
MCC-EX Line Side	480	3 Phase:	1.21	1.0	0.44	1.21	1.21	Z1:	99.62	0.21	0.09
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	99.62	---	---
		LL:	1.05	0.5	---	---	---	Z0:	180,177.40	---	---
LLG Gnd Return kA:	0.001	LLG:	1.05	0.5	---	---	---				
MCC-F	480	3 Phase:	9.71	8.1	1.79	10.00	9.86	Z1:	12.38	0.01	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	12.38	---	---
		LL:	8.41	4.0	---	---	---	Z0:	180,041.40	---	---
LLG Gnd Return kA:	0.001	LLG:	8.41	4.0	---	---	---				
MCC-LC-3 MAIN BK Line Side	480	3 Phase:	7.94	6.6	4.55	9.73	8.86	Z1:	15.15	0.01	0.03
		SLG:	8.94	4.3	4.26	10.79	---	Z2:	15.15	---	---
		LL:	6.88	3.3	---	---	---	Z0:	10.09	---	---
LLG Gnd Return kA:	10.215	LLG:	8.69	4.2	---	---	---				
MCC-LC-4 MAIN BK Line Side	480	3 Phase:	7.70	6.4	4.52	9.43	8.59	Z1:	15.61	0.01	0.04
		SLG:	8.63	4.1	4.48	10.54	---	Z2:	15.61	---	---
		LL:	6.67	3.2	---	---	---	Z0:	10.59	---	---
LLG Gnd Return kA:	9.807	LLG:	8.29	4.0	---	---	---				
MECH SHOP PANEL	480	3 Phase:	8.39	7.0	2.31	8.93	8.66	Z1:	14.33	0.01	0.03
		SLG:	8.05	3.9	2.19	8.49	---	Z2:	14.33	---	---
		LL:	7.27	3.5	---	---	---	Z0:	16.18	---	---
LLG Gnd Return kA:	7.731	LLG:	8.35	4.0	---	---	---				
PDP #1	480	3 Phase:	6.58	5.5	1.84	6.79	6.69	Z1:	18.29	0.03	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	18.29	---	---
		LL:	5.70	2.7	---	---	---	Z0:	180,056.40	---	---
LLG Gnd Return kA:	0.001	LLG:	5.70	2.7	---	---	---				
PDP #3	480	3 Phase:	7.09	5.9	2.33	7.56	7.33	Z1:	16.96	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.96	---	---
		LL:	6.14	2.9	---	---	---	Z0:	180,053.60	---	---
LLG Gnd Return kA:	0.001	LLG:	6.14	2.9	---	---	---				
PDP #4	480	3 Phase:	7.04	5.9	2.29	7.48	7.26	Z1:	17.08	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	17.08	---	---
		LL:	6.10	2.9	---	---	---	Z0:	180,053.90	---	---
LLG Gnd Return kA:	0.001	LLG:	6.10	2.9	---	---	---				
PDP #5	480	3 Phase:	7.09	5.9	2.28	7.52	7.31	Z1:	16.97	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.97	---	---
		LL:	6.14	2.9	---	---	---	Z0:	180,053.60	---	---
LLG Gnd Return kA:	0.001	LLG:	6.14	2.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
PDP #6	480	3 Phase:	7.27	6.0	2.47	7.83	7.55	Z1:	16.54	0.02	0.03
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	16.54	---	---
		LL:	6.30	3.0	---	---	---	Z0:	180,052.70	---	---
LLG Gnd Return kA:	0.001	LLG:	6.30	3.0	---	---	---				
PLM SHOP MCC	480	3 Phase:	8.42	7.0	2.38	9.00	8.71	Z1:	14.29	0.01	0.03
		SLG:	8.06	3.9	2.23	8.53	---	Z2:	14.29	---	---
		LL:	7.29	3.5	---	---	---	Z0:	16.18	---	---
LLG Gnd Return kA:	7.738	LLG:	8.38	4.0	---	---	---				
SUB1 12.5 kV Line Side	12,470	3 Phase:	3.43	74.0	4.91	4.28	3.86	Z1:	1.35	0.43	2.06
		SLG:	2.29	28.6	3.94	2.72	---	Z2:	1.35	---	---
		LL:	2.97	37.0	---	---	---	Z0:	3.36	---	---
LLG Gnd Return kA:	1.722	LLG:	3.15	39.2	---	---	---				
SUB1 Xmer Prim Side	12,470	3 Phase:	3.43	74.0	4.91	4.28	3.86	Z1:	1.35	0.43	2.06
		SLG:	2.29	28.6	3.94	2.72	---	Z2:	1.35	---	---
		LL:	2.97	37.0	---	---	---	Z0:	3.36	---	---
LLG Gnd Return kA:	1.722	LLG:	3.15	39.2	---	---	---				
SUB1 Xmer Sec Side	12,470	3 Phase:	2.18	47.1	6.31	2.88	2.54	Z1:	2.12	0.54	3.26
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.12	---	---
		LL:	1.89	23.6	---	---	---	Z0:	926.11	---	---
LLG Gnd Return kA:	0.007	LLG:	1.89	23.6	---	---	---				
SUB1-PDC1	12,470	3 Phase:	2.18	47.1	6.28	2.87	2.54	Z1:	2.12	0.54	3.26
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.12	---	---
		LL:	1.89	23.5	---	---	---	Z0:	926.13	---	---
LLG Gnd Return kA:	0.007	LLG:	1.89	23.6	---	---	---				
SUB2 12.5 kV Line Side	12,470	3 Phase:	2.47	53.4	2.59	2.68	2.58	Z1:	1.87	1.08	2.70
		SLG:	1.68	20.9	1.88	1.74	---	Z2:	1.87	---	---
		LL:	2.14	26.7	---	---	---	Z0:	4.58	---	---
LLG Gnd Return kA:	1.263	LLG:	2.34	29.1	---	---	---				
SUB2 Xmer Prim Side	12,470	3 Phase:	2.47	53.4	2.59	2.68	2.58	Z1:	1.87	1.08	2.70
		SLG:	1.68	20.9	1.88	1.74	---	Z2:	1.87	---	---
		LL:	2.14	26.7	---	---	---	Z0:	4.58	---	---
LLG Gnd Return kA:	1.263	LLG:	2.34	29.1	---	---	---				
SUB2 Xmer Sec Side	4,160	3 Phase:	2.34	16.9	4.71	2.90	2.63	Z1:	5.92	0.22	1.00
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.92	---	---
		LL:	2.03	8.4	---	---	---	Z0:	2,776.53	---	---
LLG Gnd Return kA:	0.007	LLG:	2.03	8.5	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
SUB2-PDC1	4,160	3 Phase:	2.34	16.8	4.63	2.88	2.62	Z1:	5.94	0.22	1.00
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.94	---	---
		LL:	2.02	8.4	---	---	---	Z0:	2,776.68	---	---
LLG Gnd Return kA:	0.007	LLG:	2.03	8.4	---	---	---				
T-3 Prim Side	4,160	3 Phase:	2.33	16.8	4.48	2.84	2.59	Z1:	5.97	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.97	---	---
		LL:	2.01	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
T-3 Sec Side	480	3 Phase:	8.01	6.7	4.69	9.88	8.97	Z1:	15.02	0.01	0.03
		SLG:	9.10	4.4	4.69	11.24	---	Z2:	15.02	---	---
		LL:	6.94	3.3	---	---	---	Z0:	9.60	---	---
LLG Gnd Return kA:	10.545	LLG:	8.70	4.2	---	---	---				
T-4 Prim Side	4,160	3 Phase:	2.33	16.8	4.48	2.84	2.59	Z1:	5.97	0.23	1.01
		SLG:	0.01	0.1	0.01	0.01	---	Z2:	5.97	---	---
		LL:	2.01	8.4	---	---	---	Z0:	2,776.83	---	---
LLG Gnd Return kA:	0.007	LLG:	2.02	8.4	---	---	---				
T-4 Sec Side	480	3 Phase:	7.81	6.5	4.68	9.64	8.75	Z1:	15.39	0.01	0.03
		SLG:	8.85	4.2	4.69	10.92	---	Z2:	15.39	---	---
		LL:	6.77	3.2	---	---	---	Z0:	10.00	---	---
LLG Gnd Return kA:	10.195	LLG:	8.46	4.1	---	---	---				
TK71 MAIN BK Line Side	480	3 Phase:	2.91	2.4	1.02	2.92	2.91	Z1:	41.34	0.07	0.07
		SLG:	2.47	1.2	1.03	2.48	---	Z2:	41.34	---	---
		LL:	2.52	1.2	---	---	---	Z0:	63.36	---	---
LLG Gnd Return kA:	2.147	LLG:	2.72	1.3	---	---	---				
TK71 MCC	480	3 Phase:	2.91	2.4	1.02	2.92	2.91	Z1:	41.34	0.07	0.07
		SLG:	2.47	1.2	1.03	2.48	---	Z2:	41.34	---	---
		LL:	2.52	1.2	---	---	---	Z0:	63.36	---	---
LLG Gnd Return kA:	2.147	LLG:	2.72	1.3	---	---	---				
TK72 MAIN BK Line Side	480	3 Phase:	2.77	2.3	0.79	2.77	2.77	Z1:	43.39	0.08	0.06
		SLG:	2.37	1.1	0.76	2.37	---	Z2:	43.39	---	---
		LL:	2.40	1.2	---	---	---	Z0:	65.50	---	---
LLG Gnd Return kA:	2.069	LLG:	2.63	1.3	---	---	---				
TK72 MCC	480	3 Phase:	2.77	2.3	0.79	2.77	2.77	Z1:	43.39	0.08	0.06
		SLG:	2.37	1.1	0.76	2.37	---	Z2:	43.39	---	---
		LL:	2.40	1.2	---	---	---	Z0:	65.50	---	---
LLG Gnd Return kA:	2.069	LLG:	2.63	1.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TK73 MAIN BK Line Side	480	3 Phase:	2.83	2.4	1.43	2.86	2.85	Z1:	42.53	0.06	0.08
		SLG:	2.33	1.1	1.51	2.36	---	Z2:	42.53	---	---
		LL:	2.45	1.2	---	---	---	Z0:	70.07	---	---
LLG Gnd Return kA:	1.976	LLG:	2.59	1.2	---	---	---				
TK73 MCC	480	3 Phase:	2.83	2.4	1.43	2.86	2.85	Z1:	42.53	0.06	0.08
		SLG:	2.33	1.1	1.51	2.36	---	Z2:	42.53	---	---
		LL:	2.45	1.2	---	---	---	Z0:	70.07	---	---
LLG Gnd Return kA:	1.976	LLG:	2.59	1.2	---	---	---				
TK74 MAIN BK Line Side	480	3 Phase:	2.32	1.9	0.88	2.32	2.32	Z1:	51.89	0.09	0.08
		SLG:	1.92	0.9	0.92	1.93	---	Z2:	51.89	---	---
		LL:	2.01	1.0	---	---	---	Z0:	83.77	---	---
LLG Gnd Return kA:	1.645	LLG:	2.14	1.0	---	---	---				
TK74 MCC	480	3 Phase:	2.32	1.9	0.88	2.32	2.32	Z1:	51.89	0.09	0.08
		SLG:	1.92	0.9	0.92	1.93	---	Z2:	51.89	---	---
		LL:	2.01	1.0	---	---	---	Z0:	83.77	---	---
LLG Gnd Return kA:	1.645	LLG:	2.14	1.0	---	---	---				
TK81 MAIN BK Line Side	480	3 Phase:	2.91	2.4	0.80	2.92	2.92	Z1:	41.27	0.07	0.06
		SLG:	2.52	1.2	0.78	2.52	---	Z2:	41.27	---	---
		LL:	2.52	1.2	---	---	---	Z0:	60.81	---	---
LLG Gnd Return kA:	2.215	LLG:	2.77	1.3	---	---	---				
TK81 MCC	480	3 Phase:	2.91	2.4	0.80	2.92	2.92	Z1:	41.27	0.07	0.06
		SLG:	2.52	1.2	0.78	2.52	---	Z2:	41.27	---	---
		LL:	2.52	1.2	---	---	---	Z0:	60.81	---	---
LLG Gnd Return kA:	2.215	LLG:	2.77	1.3	---	---	---				
TK82 MAIN BK Line Side	480	3 Phase:	3.14	2.6	0.83	3.14	3.14	Z1:	38.26	0.07	0.06
		SLG:	2.72	1.3	0.79	2.72	---	Z2:	38.26	---	---
		LL:	2.72	1.3	---	---	---	Z0:	55.98	---	---
LLG Gnd Return kA:	2.402	LLG:	3.01	1.4	---	---	---				
TK82 MCC	480	3 Phase:	3.14	2.6	0.83	3.14	3.14	Z1:	38.26	0.07	0.06
		SLG:	2.72	1.3	0.79	2.72	---	Z2:	38.26	---	---
		LL:	2.72	1.3	---	---	---	Z0:	55.98	---	---
LLG Gnd Return kA:	2.402	LLG:	3.01	1.4	---	---	---				
TK83 MAIN BK Line side	480	3 Phase:	3.94	3.3	0.82	3.94	3.94	Z1:	30.53	0.05	0.04
		SLG:	3.57	1.7	0.73	3.57	---	Z2:	30.53	---	---
		LL:	3.41	1.6	---	---	---	Z0:	40.32	---	---
LLG Gnd Return kA:	3.253	LLG:	3.93	1.9	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TK83 MCC	480	3 Phase:	3.94	3.3	0.82	3.94	3.94	Z1:	30.53	0.05	0.04
		SLG:	3.57	1.7	0.73	3.57	---	Z2:	30.53	---	---
		LL:	3.41	1.6	---	---	---	Z0:	40.32	---	---
LLG Gnd Return kA:	3.253	LLG:	3.93	1.9	---	---	---				
TK84 MAIN BK Line Side	480	3 Phase:	4.78	4.0	1.00	4.79	4.78	Z1:	25.16	0.04	0.04
		SLG:	4.45	2.1	0.86	4.45	---	Z2:	25.16	---	---
		LL:	4.14	2.0	---	---	---	Z0:	31.15	---	---
LLG Gnd Return kA:	4.142	LLG:	4.88	2.3	---	---	---				
TK84 MCC	480	3 Phase:	4.78	4.0	1.00	4.79	4.78	Z1:	25.16	0.04	0.04
		SLG:	4.45	2.1	0.86	4.45	---	Z2:	25.16	---	---
		LL:	4.14	2.0	---	---	---	Z0:	31.15	---	---
LLG Gnd Return kA:	4.142	LLG:	4.88	2.3	---	---	---				
TK85 MAIN BK Line Side	480	3 Phase:	6.37	5.3	1.81	6.57	6.47	Z1:	18.87	0.02	0.04
		SLG:	6.52	3.1	1.56	6.63	---	Z2:	18.87	---	---
		LL:	5.52	2.6	---	---	---	Z0:	17.85	---	---
LLG Gnd Return kA:	6.643	LLG:	6.81	3.3	---	---	---				
TK85 MCC	480	3 Phase:	6.37	5.3	1.81	6.57	6.47	Z1:	18.87	0.02	0.04
		SLG:	6.52	3.1	1.56	6.63	---	Z2:	18.87	---	---
		LL:	5.52	2.6	---	---	---	Z0:	17.85	---	---
LLG Gnd Return kA:	6.643	LLG:	6.81	3.3	---	---	---				
TK86 MAIN BK Line Side	480	3 Phase:	3.70	3.1	0.78	3.71	3.71	Z1:	32.47	0.06	0.04
		SLG:	3.30	1.6	0.67	3.30	---	Z2:	32.47	---	---
		LL:	3.21	1.5	---	---	---	Z0:	44.61	---	---
LLG Gnd Return kA:	2.971	LLG:	3.67	1.8	---	---	---				
TK86 MCC	480	3 Phase:	3.70	3.1	0.78	3.71	3.71	Z1:	32.47	0.06	0.04
		SLG:	3.30	1.6	0.67	3.30	---	Z2:	32.47	---	---
		LL:	3.21	1.5	---	---	---	Z0:	44.61	---	---
LLG Gnd Return kA:	2.971	LLG:	3.67	1.8	---	---	---				
TK87 MAIN BK Line Side	480	3 Phase:	2.83	2.4	1.01	2.83	2.83	Z1:	42.52	0.07	0.07
		SLG:	2.40	1.1	1.02	2.40	---	Z2:	42.52	---	---
		LL:	2.45	1.2	---	---	---	Z0:	65.63	---	---
LLG Gnd Return kA:	2.077	LLG:	2.64	1.3	---	---	---				
TK87 MCC	480	3 Phase:	2.83	2.4	1.01	2.83	2.83	Z1:	42.52	0.07	0.07
		SLG:	2.40	1.1	1.02	2.40	---	Z2:	42.52	---	---
		LL:	2.45	1.2	---	---	---	Z0:	65.63	---	---
LLG Gnd Return kA:	2.077	LLG:	2.64	1.3	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TK90/88 MAIN BK Line Side	480	3 Phase:	4.93	4.1	1.55	5.01	4.97	Z1:	24.42	0.03	0.05
		SLG:	4.54	2.2	1.41	4.59	---	Z2:	24.42	---	---
		LL:	4.27	2.0	---	---	---	Z0:	30.70	---	---
LLG Gnd Return kA:	4.208	LLG:	4.88	2.3	---	---	---				
TK90/88 MCC	480	3 Phase:	4.93	4.1	1.55	5.01	4.97	Z1:	24.42	0.03	0.05
		SLG:	4.54	2.2	1.41	4.59	---	Z2:	24.42	---	---
		LL:	4.27	2.0	---	---	---	Z0:	30.70	---	---
LLG Gnd Return kA:	4.208	LLG:	4.88	2.3	---	---	---				
TX-A Prim Side	12,470	3 Phase:	2.17	46.9	5.89	2.82	2.51	Z1:	2.13	0.58	3.26
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.13	---	---
		LL:	1.88	23.5	---	---	---	Z0:	926.18	---	---
LLG Gnd Return kA:	0.007	LLG:	1.88	23.5	---	---	---				
TX-A Sec Side	480	3 Phase:	14.79	12.3	5.49	18.92	16.92	Z1:	8.13	0.00	0.02
		SLG:	0.00	0.0	0.03	0.00	---	Z2:	8.13	---	---
		LL:	12.81	6.1	---	---	---	Z0:	180,033.20	---	---
LLG Gnd Return kA:	0.001	LLG:	12.81	6.1	---	---	---				
TX-B Prim Side	12,470	3 Phase:	2.17	47.0	6.03	2.84	2.52	Z1:	2.13	0.57	3.26
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.13	---	---
		LL:	1.88	23.5	---	---	---	Z0:	926.17	---	---
LLG Gnd Return kA:	0.007	LLG:	1.89	23.5	---	---	---				
TX-B Sec Side	480	3 Phase:	14.16	11.8	5.84	18.36	16.33	Z1:	8.50	0.00	0.02
		SLG:	0.00	0.0	0.02	0.00	---	Z2:	8.50	---	---
		LL:	12.26	5.9	---	---	---	Z0:	182,360.20	---	---
LLG Gnd Return kA:	0.001	LLG:	12.26	5.9	---	---	---				
TX-E Prim Side	12,470	3 Phase:	2.11	45.6	4.27	2.55	2.34	Z1:	2.19	0.80	3.32
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.19	---	---
		LL:	1.83	22.8	---	---	---	Z0:	926.41	---	---
LLG Gnd Return kA:	0.007	LLG:	1.83	22.8	---	---	---				
TX-E Sec Side	480	3 Phase:	10.65	8.9	4.65	13.13	11.92	Z1:	11.29	0.01	0.03
		SLG:	11.35	5.4	4.66	14.00	---	Z2:	11.29	---	---
		LL:	9.23	4.4	---	---	---	Z0:	9.20	---	---
LLG Gnd Return kA:	12.153	LLG:	11.03	5.3	---	---	---				
TX-F Prim Side	12,470	3 Phase:	2.17	46.8	5.72	2.80	2.49	Z1:	2.14	0.60	3.27
		SLG:	0.01	0.2	0.01	0.01	---	Z2:	2.14	---	---
		LL:	1.88	23.4	---	---	---	Z0:	926.20	---	---
LLG Gnd Return kA:	0.007	LLG:	1.88	23.4	---	---	---				

Low Voltage 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		Fault Duty kA	Fault Duty MVA	X/R	-----Asym kA----- Max RMS	Avg RMS	Sequence Impedance pu		Equivalent R	+jX
TX-F Sec Side	4,160	3 Phase:	2.40	17.3	6.21	3.15	2.79	Z1:	5.79	0.16	0.99
		SLG:	2.73	11.4	6.29	3.60	---	Z2:	5.79	---	---
		LL:	2.08	8.6	---	---	---	Z0:	3.65	---	---
LLG Gnd Return kA:	3.179	LLG:	2.61	10.8	---	---	---				

Momentary 3 Phase

Fault Location Bus Name	Bus Voltage	-----Sym Fault Duty----- kA	MVA	X/R	---------Mom kA--------- Sym*1.6	Based on X/R	--------Crest kA-------- Sym*2.7	Based on X/R	Equivalent R	+jX
02-MAIN SERVICE SWGR	12,470	1.897	40.96	6.16	3.035	2.490	5.121	4.290	0.63	3.74
5KV SWGR	4,160	2.265	16.32	6.06	3.624	2.960	6.116	5.110	0.17	1.05
BB-ESB1-TXR1 Prim Side	12,470	1.897	40.98	6.16	3.036	2.490	5.122	4.290	0.63	3.74
BB-ESB2-TXR1 Prim Side	12,470	1.897	40.98	6.16	3.036	2.490	5.122	4.290	0.63	3.74
BB-ESB3-TXR1 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
BB-ESB4-TXR1 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
BB-ESB5-TXR1 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
SUB1 12.5 kV Line Side	12,470	3.236	69.89	4.77	5.177	4.010	8.737	6.940	0.46	2.18
SUB1 Xmer Prim Side	12,470	3.236	69.89	4.77	5.177	4.010	8.737	6.940	0.46	2.18
SUB1 Xmer Sec Side	12,470	1.901	41.06	6.38	3.042	2.510	5.133	4.330	0.61	3.74
SUB1-PDC1	12,470	1.900	41.04	6.34	3.040	2.510	5.130	4.320	0.61	3.74
SUB2 12.5 kV Line Side	12,470	2.352	50.80	2.45	3.763	2.530	6.350	4.250	1.16	2.83
SUB2 Xmer Prim Side	12,470	2.352	50.80	2.45	3.763	2.530	6.350	4.250	1.16	2.83
SUB2 Xmer Sec Side	4,160	1.911	13.77	4.57	3.058	2.350	5.160	4.060	0.27	1.23
SUB2-PDC1	4,160	1.904	13.72	4.48	3.046	2.320	5.140	4.030	0.28	1.23
T-3 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
T-4 Prim Side	4,160	1.896	13.66	4.36	3.034	2.300	5.119	3.980	0.28	1.23
TX-A Prim Side	12,470	1.893	40.88	5.97	3.028	2.470	5.110	4.260	0.65	3.75
TX-B Prim Side	12,470	1.895	40.94	6.11	3.033	2.480	5.118	4.280	0.63	3.74
TX-E Prim Side	12,470	1.847	39.90	4.47	2.956	2.250	4.988	3.910	0.87	3.80
TX-F Prim Side	12,470	1.889	40.81	5.82	3.023	2.450	5.102	4.230	0.66	3.75
TX-F Sec Side	4,160	2.274	16.38	6.23	3.638	2.990	6.140	5.160	0.17	1.04

Momentary Unbalanced

Fault Location Bus Name	Bus Voltage		---Sym Fault Duty--- kA	MVA	X/R	--Mom. Fault Duty-- kA*1.6	Based on X/R	Sequence Impedance pu	
02-MAIN SERVICE SWGR	12,470	3 Phase:	1.897	40.96	6.16	3.035	2.490	Z1:	2.44
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.44
		LL:	1.642	20.48	---	---	---	Z0:	926.16
LLG Gnd Return kA:	0.01	LLG:	1.646	20.53	---	---	---		
5KV SWGR	4,160	3 Phase:	2.265	16.32	6.06	3.624	2.960	Z1:	6.13
		SLG:	2.608	10.85	6.06	4.173	3.410	Z2:	6.13
		LL:	1.962	8.16	---	---	---	Z0:	3.71
LLG Gnd Return kA:	3.07	LLG:	2.490	10.36	---	---	---		
BB-ESB1-TXR1 Prim Side	12,470	3 Phase:	1.897	40.98	6.16	3.036	2.490	Z1:	2.44
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.44
		LL:	1.643	20.49	---	---	---	Z0:	926.16
LLG Gnd Return kA:	0.01	LLG:	1.647	20.53	---	---	---		
BB-ESB2-TXR1 Prim Side	12,470	3 Phase:	1.897	40.98	6.16	3.036	2.490	Z1:	2.44
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.44
		LL:	1.643	20.49	---	---	---	Z0:	926.16
LLG Gnd Return kA:	0.01	LLG:	1.647	20.53	---	---	---		
BB-ESB3-TXR1 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
BB-ESB4-TXR1 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
BB-ESB5-TXR1 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
SUB1 12.5 kV Line Side	12,470	3 Phase:	3.236	69.89	4.77	5.177	4.010	Z1:	1.43
		SLG:	2.234	27.86	3.91	3.575	2.650	Z2:	1.43
		LL:	2.802	34.95	---	---	---	Z0:	3.36
LLG Gnd Return kA:	1.71	LLG:	2.981	37.18	---	---	---		
SUB1 Xmer Prim Side	12,470	3 Phase:	3.236	69.89	4.77	5.177	4.010	Z1:	1.43
		SLG:	2.234	27.86	3.91	3.575	2.650	Z2:	1.43
		LL:	2.802	34.95	---	---	---	Z0:	3.36
LLG Gnd Return kA:	1.71	LLG:	2.981	37.18	---	---	---		
SUB1 Xmer Sec Side	12,470	3 Phase:	1.901	41.06	6.38	3.042	2.510	Z1:	2.44
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.44
		LL:	1.647	20.53	---	---	---	Z0:	926.11
LLG Gnd Return kA:	0.01	LLG:	1.650	20.58	---	---	---		
SUB1-PDC1	12,470	3 Phase:	1.900	41.04	6.34	3.040	2.510	Z1:	2.44
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.44
		LL:	1.646	20.52	---	---	---	Z0:	926.13
LLG Gnd Return kA:	0.01	LLG:	1.649	20.57	---	---	---		

Momentary Unbalanced

Fault Location Bus Name	Bus Voltage		---Sym Fault Duty--- kA	MVA	X/R	--Mom. Fault Duty-- kA*1.6	Based on X/R	Sequence Impedance pu	
SUB2 12.5 kV Line Side	12,470	3 Phase:	2.352	50.80	2.45	3.763	2.530	Z1:	1.97
		SLG:	1.639	20.44	1.86	2.622	1.690	Z2:	1.97
		LL:	2.037	25.40	---	---	---	Z0:	4.58
LLG Gnd Return kA:	1.25	LLG:	2.226	27.76	---	---	---		
SUB2 Xmer Prim Side	12,470	3 Phase:	2.352	50.80	2.45	3.763	2.530	Z1:	1.97
		SLG:	1.639	20.44	1.85	2.622	1.690	Z2:	1.97
		LL:	2.037	25.40	---	---	---	Z0:	4.58
LLG Gnd Return kA:	1.25	LLG:	2.226	27.76	---	---	---		
SUB2 Xmer Sec Side	4,160	3 Phase:	1.911	13.77	4.57	3.058	2.350	Z1:	7.26
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.26
		LL:	1.655	6.89	---	---	---	Z0:	2,776.53
LLG Gnd Return kA:	0.01	LLG:	1.659	6.90	---	---	---		
SUB2-PDC1	4,160	3 Phase:	1.904	13.72	4.48	3.046	2.320	Z1:	7.29
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.29
		LL:	1.649	6.86	---	---	---	Z0:	2,776.68
LLG Gnd Return kA:	0.01	LLG:	1.652	6.87	---	---	---		
T-3 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
T-4 Prim Side	4,160	3 Phase:	1.896	13.66	4.36	3.034	2.300	Z1:	7.32
		SLG:	0.015	0.06	0.01	0.024	0.010	Z2:	7.32
		LL:	1.642	6.83	---	---	---	Z0:	2,776.83
LLG Gnd Return kA:	0.01	LLG:	1.646	6.85	---	---	---		
TX-A Prim Side	12,470	3 Phase:	1.893	40.88	5.97	3.028	2.470	Z1:	2.45
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.45
		LL:	1.639	20.44	---	---	---	Z0:	926.18
LLG Gnd Return kA:	0.01	LLG:	1.643	20.49	---	---	---		
TX-B Prim Side	12,470	3 Phase:	1.895	40.94	6.11	3.033	2.480	Z1:	2.44
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.44
		LL:	1.642	20.47	---	---	---	Z0:	926.17
LLG Gnd Return kA:	0.01	LLG:	1.645	20.52	---	---	---		
TX-E Prim Side	12,470	3 Phase:	1.847	39.90	4.47	2.956	2.250	Z1:	2.51
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.51
		LL:	1.600	19.95	---	---	---	Z0:	926.41
LLG Gnd Return kA:	0.01	LLG:	1.604	20.00	---	---	---		
TX-F Prim Side	12,470	3 Phase:	1.889	40.81	5.82	3.023	2.450	Z1:	2.45
		SLG:	0.015	0.19	0.01	0.024	0.010	Z2:	2.45
		LL:	1.636	20.40	---	---	---	Z0:	926.20
LLG Gnd Return kA:	0.01	LLG:	1.640	20.45	---	---	---		
TX-F Sec Side	4,160	3 Phase:	2.274	16.38	6.23	3.638	2.990	Z1:	6.10
		SLG:	2.625	10.92	6.30	4.200	3.460	Z2:	6.10
		LL:	1.969	8.19	---	---	---	Z0:	3.65
LLG Gnd Return kA:	3.10	LLG:	2.501	10.41	---	---	---		

Interrupting 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		-----Init Sym Fault----- kA	X/R	Equivalent R	+jX	Seq. Imp. pu		-------Interrupting Fault kA----- 2 cyc.	3 cyc.	5 cyc.	8 cyc.
02-MAIN SERVICE SWGR	12,470	3 Phase:	1.64	6.40	0.69	4.34	Z1: 2.83	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.83	Tot:	1.79	1.64	1.64	1.64
NACD:	0.87	LL:	1.42	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
5KV SWGR	4,160	3 Phase:	2.13	6.16	0.18	1.11	Z1: 6.51	3Ph.Sym:	2.13	2.13	2.13	2.13
		SLG:	2.49	6.14	---	---	Z2: 6.51	Tot:	2.31	2.13	2.13	2.13
NACD:	0.87	LL:	1.84	---	---	---	Z0: 3.71	SLG Sym:	2.49	2.49	2.49	2.49
LLG Gnd Return kA:	2.988	LLG:	2.37	---	---	---		Tot:	2.70	2.49	2.49	2.49
BB-ESB1-TXR1 Prim Side	12,470	3 Phase:	1.64	6.40	0.69	4.34	Z1: 2.83	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.83	Tot:	1.79	1.64	1.64	1.64
NACD:	0.87	LL:	1.42	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB2-TXR1 Prim Side	12,470	3 Phase:	1.64	6.40	0.69	4.34	Z1: 2.83	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.83	Tot:	1.79	1.64	1.64	1.64
NACD:	0.87	LL:	1.42	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB3-TXR1 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB4-TXR1 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
BB-ESB5-TXR1 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
SUB1 12.5 kV Line Side	12,470	3 Phase:	3.03	4.72	0.50	2.33	Z1: 1.53	3Ph.Sym:	3.03	3.03	3.03	3.03
		SLG:	2.17	3.92	---	---	Z2: 1.53	Tot:	3.17	3.03	3.03	3.03
NACD:	0.94	LL:	2.62	---	---	---	Z0: 3.36	SLG Sym:	2.17	2.17	2.17	2.17
LLG Gnd Return kA:	1.685	LLG:	2.80	---	---	---		Tot:	2.25	2.17	2.17	2.17
SUB1 Xmer Prim Side	12,470	3 Phase:	3.03	4.72	0.50	2.33	Z1: 1.53	3Ph.Sym:	3.03	3.03	3.03	3.03
		SLG:	2.17	3.92	---	---	Z2: 1.53	Tot:	3.17	3.03	3.03	3.03
NACD:	0.94	LL:	2.62	---	---	---	Z0: 3.36	SLG Sym:	2.17	2.17	2.17	2.17
LLG Gnd Return kA:	1.685	LLG:	2.80	---	---	---		Tot:	2.25	2.17	2.17	2.17
SUB1 Xmer Sec Side	12,470	3 Phase:	1.64	6.62	0.67	4.34	Z1: 2.82	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.82	Tot:	1.81	1.65	1.64	1.64
NACD:	0.87	LL:	1.42	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01

Interrupting 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		-----Init Sym Fault----- kA	X/R	Equivalent R	+jX	Seq. Imp. pu		-------Interrupting Fault kA----- 2 cyc.	3 cyc.	5 cyc.	8 cyc.
SUB1-PDC1	12,470	3 Phase:	1.64	6.57	0.67	4.34	Z1: 2.82	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.82	Tot:	1.80	1.64	1.64	1.64
NACD:	0.87	LL:	1.42	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
SUB2 12.5 kV Line Side	12,470	3 Phase:	2.35	2.45	1.16	2.83	Z1: 1.97	3Ph.Sym:	2.35	2.35	2.35	2.35
		SLG:	1.64	1.86	---	---	Z2: 1.97	Tot:	2.40	2.35	2.35	2.35
NACD:	1.00	LL:	2.04	---	---	---	Z0: 4.58	SLG Sym:	1.64	1.64	1.64	1.64
LLG Gnd Return kA:	1.252	LLG:	2.23	---	---	---		Tot:	1.66	1.64	1.64	1.64
SUB2 Xmer Prim Side	12,470	3 Phase:	2.35	2.45	1.16	2.83	Z1: 1.97	3Ph.Sym:	2.35	2.35	2.35	2.35
		SLG:	1.64	1.85	---	---	Z2: 1.97	Tot:	2.40	2.35	2.35	2.35
NACD:	1.00	LL:	2.04	---	---	---	Z0: 4.58	SLG Sym:	1.64	1.64	1.64	1.64
LLG Gnd Return kA:	1.252	LLG:	2.23	---	---	---		Tot:	1.66	1.64	1.64	1.64
SUB2 Xmer Sec Side	4,160	3 Phase:	1.91	4.57	0.27	1.23	Z1: 7.26	3Ph.Sym:	1.91	1.91	1.91	1.91
		SLG:	0.01	0.01	---	---	Z2: 7.26	Tot:	2.00	1.91	1.91	1.91
NACD:	1.00	LL:	1.66	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.66	---	---	---		Tot:	0.01	0.01	0.01	0.01
SUB2-PDC1	4,160	3 Phase:	1.90	4.48	0.28	1.23	Z1: 7.29	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.29	Tot:	1.99	1.90	1.90	1.90
NACD:	1.00	LL:	1.65	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
T-3 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
T-4 Prim Side	4,160	3 Phase:	1.90	4.36	0.28	1.23	Z1: 7.32	3Ph.Sym:	1.90	1.90	1.90	1.90
		SLG:	0.01	0.01	---	---	Z2: 7.32	Tot:	1.98	1.90	1.90	1.90
NACD:	1.00	LL:	1.64	---	---	---	Z0: 2,776.	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.65	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-A Prim Side	12,470	3 Phase:	1.63	6.22	0.71	4.35	Z1: 2.83	3Ph.Sym:	1.63	1.63	1.63	1.63
		SLG:	0.01	0.01	---	---	Z2: 2.83	Tot:	1.78	1.64	1.63	1.63
NACD:	0.87	LL:	1.41	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-B Prim Side	12,470	3 Phase:	1.64	6.34	0.70	4.35	Z1: 2.83	3Ph.Sym:	1.64	1.64	1.64	1.64
		SLG:	0.01	0.01	---	---	Z2: 2.83	Tot:	1.78	1.64	1.64	1.64
NACD:	0.87	LL:	1.42	---	---	---	Z0: 926.1	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-E Prim Side	12,470	3 Phase:	1.60	4.77	0.93	4.40	Z1: 2.89	3Ph.Sym:	1.60	1.60	1.60	1.60
		SLG:	0.01	0.01	---	---	Z2: 2.89	Tot:	1.67	1.60	1.60	1.60
NACD:	0.87	LL:	1.39	---	---	---	Z0: 926.4	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.39	---	---	---		Tot:	0.01	0.01	0.01	0.01

Interrupting 3 Phase and Unbalanced

Fault Location Bus Name	Bus Voltage		-----Init Sym Fault----- kA	X/R	Equivalent R	+jX	Seq. Imp. pu		-------Interrupting Fault kA----- 2 cyc.	3 cyc.	5 cyc.	8 cyc.
TX-F Prim Side	12,470	3 Phase:	1.63	6.08	0.73	4.35	Z1: 2.84	3Ph.Sym:	1.63	1.63	1.63	1.63
		SLG:	0.01	0.01	---	---	Z2: 2.84	Tot:	1.77	1.63	1.63	1.63
NACD:	0.87	LL:	1.41	---	---	---	Z0: 926.2(	SLG Sym:	0.01	0.01	0.01	0.01
LLG Gnd Return kA:	0.007	LLG:	1.42	---	---	---		Tot:	0.01	0.01	0.01	0.01
TX-F Sec Side	4,160	3 Phase:	2.14	6.33	0.18	1.11	Z1: 6.49	3Ph.Sym:	2.14	2.14	2.14	2.14
		SLG:	2.50	6.38	---	---	Z2: 6.49	Tot:	2.33	2.14	2.14	2.14
NACD:	0.87	LL:	1.85	---	---	---	Z0: 3.65	SLG Sym:	2.50	2.50	2.50	2.50
LLG Gnd Return kA:	3.018	LLG:	2.38	---	---	---		Tot:	2.74	2.51	2.50	2.50

Appendix 2

Arc Flash Results and Protective Device Coordination

TETRA TECH

Burnaby Terminal
216239
Rev B - Issued For Review

Worst Case Arc Flash Results - In Service Mode - (Group 2) Settings

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
02-MAIN SERVICE SWGR	SUB1-PDC1A Relay (50/51P)	12.47	2.20	1.94	1.93	0.1292	0.0830	No	SWG	152	0.40	0.91	0.53	(*S2)
BB-ESB1-TXR1 Prim Side	BB-ESB1-MCC LINE (50/51P)	12.47	2.20	1.96	1.95	0.2826	0.0830	No	SWG	152	0.64	0.91	0.85	(*S2)
BB-ESB2-TXR1 Prim Side	BB-ESB2-MCC LINE (50/51P)	12.47	2.20	1.93	1.92	0.2826	0.0830	No	SWG	152	0.64	0.91	0.85	(*S2)
SUB1 12.5 kV Line Side	MaxTripTime @2.0s	12.47	3.38	2.83	2.81	2	0.0000	Yes	SWG	152	5.26	0.91	6.6	(*N2) (*N9) (*S2)
SUB1 Xmer Prim Side	SUB1 Fdr Relay (50/51P)	12.47	3.38	2.83	2.38	0.348	0.0830	Yes	SWG	152	0.94	0.91	1.2	(*N3) (*S2)
SUB1 Xmer Sec Side	SUB1 Fdr Relay (50/51P)	12.47	2.21	1.30	1.10	1.354	0.0830	No	SWG	152	1.98	0.91	2.5	(*N3) (*S2)
SUB1-PDC1	SUB1 Fdr Relay (50/51P)	12.47	2.21	1.30	1.10	1.357	0.0830	No	SWG	152	1.98	0.91	2.5	(*N3) (*S2)
SUB2 12.5 kV Line Side	MaxTripTime @2.0s	12.47	2.47	2.35	2.34	2	0.0000	Yes	SWG	152	4.27	0.91	5.4	(*N2) (*N9) (*S3)
SUB2 Xmer Prim Side	SUB2 Xmer Prim Relay (50/51P)	12.47	2.47	2.35	2.34	0.1612	0.0830	Yes	SWG	152	0.50	0.91	0.67	(*S3)
TX-A Prim Side	SW-A	12.47	2.20	2.11	2.10	0.0381	0.0000	No	SWG	152	0.09	0.91	0.12	(*S2)
TX-B Prim Side	SW-B	12.47	2.20	2.13	2.12	0.0378	0.0000	No	SWG	152	0.09	0.91	0.12	(*S2)
TX-E Prim Side	SW-E	12.47	2.13	2.13	2.12	0.0325	0.0000	No	SWG	152	0.07	0.91	0.10	(*S2)
TX-F Prim Side	SW-F	12.47	2.19	2.09	1.77	0.0885	0.0000	No	SWG	152	0.17	0.91	0.23	(*N3) (*S2)
5KV SWGR	SUB1-PDC1A Relay (50/51P)	4.16	2.55	2.05	1.73	0.3107	0.0830	Yes	SWG	104	0.50	0.91	0.67	(*N3) (*N5) (*S2)
BB-ESB3-TXR1 Prim Side	BB-ESB3-MCC LINE (50/51P)	4.16	2.33	2.17	2.16	0.4077	0.0830	No	SWG	104	0.95	0.91	1.3	(*S3)
BB-ESB4-TXR1 Prim Side	BB-ESB4-MCC LINE (50/51P)	4.16	2.33	2.29	2.28	0.0646	0.0830	No	SWG	104	0.30	0.91	0.41	(*S3)
BB-ESB5-TXR1 Prim Side	BB-ESB5-MCC LINE (50/51P)	4.16	2.33	2.16	2.15	0.2018	0.0830	No	SWG	104	0.56	0.91	0.75	(*S3)
SUB2 Xmer Sec Side	SUB2 Xmer Prim Relay (50/51P)	4.16	2.34	1.91	1.62	0.5433	0.0830	No	SWG	104	1.02	0.91	1.3	(*N3) (*S3)
SUB2-PDC1	SUB2 Xmer Prim Relay (50/51P)	4.16	2.34	1.90	1.61	0.5473	0.0830	No	SWG	104	1.03	0.91	1.3	(*N3) (*S3)
T-3 Prim Side	LC3-MCC LINE Relay (50/51P)	4.16	2.33	2.29	2.28	0.1978	0.0830	No	SWG	104	0.55	0.91	0.74	(*S3)
T-4 Prim Side	LC4-MCC LINE Relay (50/51P)	4.16	2.33	2.29	2.28	0.2018	0.0830	No	SWG	104	0.56	0.91	0.75	(*S3)
TX-F Sec Side	SUB1-PDC1A Relay (50/51P)	4.16	2.56	2.06	1.74	0.3084	0.0830	Yes	SWG	104	0.50	0.91	0.67	(*N3) (*N5) (*S2)
BB-ESB1-MCC	ESB1-MCC MAIN Bkr	0.60	21.35	14.90	11.03	0.03	0.0000	Yes	PNL	25	0.72	0.45	2.5	(*S2)
BB-ESB1-TXR1 Sec Side	BB-ESB1-MCC LINE (50/51P)	0.60	22.03	16.55	10.39	0.8758	0.0830	Yes	PNL	25	3.36	0.45	32	(*N3) (*S3)
BB-ESB1-VFD11 Line Side	BPM-11 Bkr	0.60	20.95	19.27	14.29	0.0192	0.0000	Yes	PNL	25	0.42	0.45	1.0	(*S2)
BB-ESB2-VFD12 Line Side	BPM-12 Bkr	0.60	21.90	20.22	14.94	0.0186	0.0000	Yes	PNL	25	0.42	0.45	1.0	(*S2)

TETRA TECH

Worst Case Arc Flash Results - In Service Mode - (Group 2) Settings

Burnaby Terminal
216239
Rev B - Issued For Review

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
BB-ESB1-VFD21 Line Side	BPM-21 Bkr	0.60	20.95	19.27	14.29	0.0179	0.0000	Yes	PNL	25	0.40	0.45	0.96	(*S2)
BB-ESB2-VFD22 Line Side	BPM-22 Bkr	0.60	21.90	20.22	14.94	0.0178	0.0000	Yes	PNL	25	0.41	0.45	1.0	(*S2)
BB-ESB1-VFD31 Line Side	BPM-31 Bkr	0.60	20.95	19.27	14.29	0.0179	0.0000	Yes	PNL	25	0.40	0.45	0.96	(*S2)
BB-ESB2-VFD32 Line Side	BPM-32 Bkr	0.60	21.90	20.22	14.94	0.0178	0.0000	Yes	PNL	25	0.41	0.45	1.0	(*S2)
BB-ESB2A	ESB2A-MCC MAIN Bkr	0.60	20.20	18.32	13.62	0.014	0.0000	Yes	PNL	25	0.34	0.45	0.73	(*S2)
BB-ESB2-MCC	ESB2-MCC MAIN Bkr	0.60	22.33	14.82	10.93	0.03	0.0000	Yes	PNL	25	0.76	0.45	2.8	(*S2)
BB-ESB2-TXR1 Sec Side	BB-ESB2-MCC LINE (50/51P)	0.60	22.86	16.43	10.28	0.8925	0.0830	Yes	PNL	25	3.40	0.45	32	(*N3) (*S3)
BB-ESB3A-MCC	BB-ESB3A-MCC Main Bkr	0.60	6.19	5.83	4.76	0.0137	0.0000	Yes	PNL	25	0.16	0.45	0.22	(*S3)
BB-ESB3A-MCC Main Bkr LineSide	BB-ESB3A-MCC LINE Bkr	0.60	6.48	6.12	4.98	0.0169	0.0000	Yes	PNL	25	0.19	0.45	0.28	(*S3)
BB-ESB3B-MCC	BB-ESB3B-MCC Main Bkr	0.60	6.49	6.04	4.91	0.0135	0.0000	Yes	PNL	25	0.16	0.45	0.23	(*S3)
BB-ESB3B-MCC Main Bkr LineSide	BB-ESB3B-MCC LINE Bkr	0.60	6.49	6.04	4.91	0.0135	0.0000	Yes	PNL	25	0.16	0.45	0.23	(*S3)
BB-ESB3-MCC	ESB3-MCC MAIN Bkr	0.60	6.78	5.52	4.47	0.0254	0.0000	Yes	PNL	25	0.25	0.45	0.45	(*S3)
BB-ESB3-TXR1 Sec Side	BB-ESB3-MCC LINE (50/51P)	0.60	7.11	5.87	4.03	0.9687	0.0830	Yes	PNL	25	1.94	0.45	13	(*N3) (*S3)
BB-ESB4-MCC	BB-ESB4-MCC LINE (50/51P)	0.60	1.88	1.58	1.20	1.515	0.0830	Yes	PNL	25	1.15	0.45	5.5	(*N3) (*N5) (*S3)
BB-ESB4-TXR1 Sec Side	BB-ESB4-MCC LINE (50/51P)	0.60	2.02	1.72	1.30	1.302	0.0830	Yes	PNL	25	1.11	0.45	5.1	(*N3) (*S3)
BB-ESB5A-MCC	ESB5A-MCC MAIN Bkr	0.60	5.50	5.32	4.38	0.0112	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S3)
BB-ESB5B-MCC	ESB5B-MCC MAIN Bkr	0.60	5.54	5.08	4.19	0.0114	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S3)
BB-ESB5C-MCC	ESB5C-MCC MAIN Bkr	0.60	5.54	5.08	4.19	0.0114	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S3)
BB-ESB5-MCC	ESB5-MCC MAIN Bkr	0.60	6.03	4.76	3.90	0.0281	0.0000	Yes	PNL	25	0.31	0.45	0.63	(*S3)
BB-ESB5-TXR1 Sec Side	BB-ESB5-MCC LINE (50/51P)	0.60	7.15	5.86	4.02	0.4804	0.0830	Yes	PNL	25	1.34	0.45	7.1	(*N3) (*S3)
ESB1-MCC MAIN Bkr Line side	BB-ESB1-MCC LINE (50/51P)	0.60	20.44	14.55	9.19	1.096	0.0830	Yes	PNL	25	3.55	0.45	35	(*N3) (*S3)
ESB2A-MCC MAIN Bkr Line Side	ESB2A-MCC LINE Bkr	0.60	20.22	18.34	13.63	0.014	0.0000	Yes	PNL	25	0.34	0.45	0.73	(*S2)
ESB2-MCC MAIN Bkr Line side	BB-ESB2-MCC LINE (50/51P)	0.60	21.41	14.45	9.09	1.117	0.0830	Yes	PNL	25	3.59	0.45	35	(*N3) (*S3)
ESB3-MCC MAIN Bkr Line Side	BB-ESB3-MCC LINE (50/51P)	0.60	6.78	5.52	3.80	1.07	0.0830	Yes	PNL	25	1.98	0.45	13	(*N3) (*S3)
ESB4-MCC MAIN Bkr Line Side	BB-ESB4-MCC LINE (50/51P)	0.60	1.88	1.58	1.20	1.515	0.0830	Yes	PNL	25	1.15	0.45	5.5	(*N3) (*S3)
ESB5A-MCC MAIN Bkr Line Side	ESB5A-MCC LINE Bkr	0.60	5.51	5.33	4.39	0.0112	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S3)

TETRA TECH

Worst Case Arc Flash Results - In Service Mode - (Group 2) Settings

Burnaby Terminal
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Rev B - Issued For Review

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
ESB5B-MCC MAIN Bkr Line Side	ESB5B-MCC LINE Bkr	0.60	5.54	5.09	4.19	0.0114	0.0000	Yes	PNL	25	0.14	0.45	0.16	(*S3)
ESB5C-MCC MAIN Bkr Line Side	ESB5C-MCC LINE Bkr	0.60	5.54	5.09	4.19	0.0127	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S3)
ESB5-MCC MAIN Bkr Line Side	BB-ESB5-MCC LINE (50/51P)	0.60	6.03	4.76	3.31	0.6789	0.0830	Yes	PNL	25	1.43	0.45	7.8	(*N3) (*S3)
BB-LC3A-MCC	LC3A-MCC MAIN Bkr	0.48	6.86	6.65	4.61	0.0121	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S3)
BB-LC4A-MCC	LC4A-MCC MAIN Bkr	0.48	5.84	5.62	3.98	0.0128	0.0000	Yes	PNL	25	0.14	0.45	0.17	(*S3)
CDP PANEL A	CDP A FDR BK	0.48	7.20	7.20	4.95	0.0193	0.0000	No	PNL	25	0.23	0.45	0.39	(*S2)
CDP PANEL AX (CTRL RM BLDG)	CDP-AX FDR BK	0.48	5.70	5.70	4.05	0.0157	0.0000	No	PNL	25	0.18	0.45	0.26	(*S2)
CDP PANEL BX	CDP-BX FDR BK	0.48	6.73	5.43	3.77	0.0166	0.0000	No	PNL	25	0.20	0.45	0.32	(*S2)
CDP PANEL SB-A1	CDP SB-A1 FDR BK	0.48	4.37	4.37	3.24	0.0169	0.0000	No	PNL	25	0.16	0.45	0.22	(*S2)
DIV. OFFICE BASEMENT	DIV OFFICE FDR BK	0.48	1.64	1.63	1.18	0.1676	0.0000	No	PNL	25	0.33	0.45	0.71	(*N3) (*S3)
LC3A-MCC MAIN Bkr Line Side	LC3A-MCC LINE Bkr	0.48	6.86	6.65	4.61	0.0135	0.0000	Yes	PNL	25	0.15	0.45	0.20	(*S3)
LC4A-MCC MAIN Bkr Line Side	LC4A-MCC LINE Bkr	0.48	6.69	6.46	4.49	0.0135	0.0000	Yes	PNL	25	0.15	0.45	0.20	(*S3)
LEVEE BUILDING	LEVEE BLDG FDR FU	0.48	0.84	0.83	0.78	0.01	0.0000	No	PNL	25	0.05	0.45	0.03	(*S2)
MCC LC-3	MCC-LC-3 MAIN BK	0.48	7.86	7.53	5.12	0.0222	0.0000	Yes	PNL	25	0.22	0.45	0.38	(*S3)
MCC LC-4	MCC-LC-4 MAIN BK	0.48	7.63	7.31	4.98	0.03	0.0000	Yes	PNL	25	0.27	0.45	0.50	(*S3)
MCC-A	MCC-A MAIN	0.48	12.61	9.87	6.26	0.0233	0.0000	No	PNL	25	0.48	0.45	1.3	(*S2)
MCC-A MAIN Line Side	SW-A	0.48	13.00	10.29	5.52	1.745	0.0000	No	PNL	25	3.82	0.45	39	(*N3) (*S3)
MCC-AX	ATS FDR BK	0.48	11.12	9.54	6.16	0.013	0.0000	No	PNL	25	0.23	0.45	0.39	(*S2)
MCC-B	SW-B	0.48	12.40	10.20	5.51	1.753	0.0000	No	PNL	25	3.80	0.45	39	(*N3) (*N5) (*S3)
MCC-B MAIN Line Side	SW-B	0.48	12.40	10.20	5.51	1.753	0.0000	No	PNL	25	3.80	0.45	39	(*N3) (*S3)
MCC-DX	MCC-DX FDR BK	0.48	6.07	5.45	3.84	0.0162	0.0000	No	PNL	25	0.19	0.45	0.28	(*S2)
MCC-E	SW-E	0.48	9.12	9.03	5.10	1.165	0.0000	Yes	PNL	25	2.36	0.45	18	(*N3) (*N5) (*S3)
MCC-E MAIN Line Side	SW-E	0.48	9.12	9.03	5.10	1.165	0.0000	Yes	PNL	25	2.36	0.45	18	(*N3) (*S3)
MCC-EX	MCC-EX FDR BK	0.48	0.57	0.57	0.57	1.814	0.0000	No	PNL	25	0.46	0.45	1.2	(*N5) (*N1) (*S3)
MCC-EX Line Side	MCC-EX FDR BK	0.48	1.10	1.10	0.84	0.6517	0.0000	No	PNL	25	0.61	0.45	1.9	(*N3) (*S3)
MCC-F	MCCF FDR BK	0.48	8.93	8.90	5.94	0.0117	0.0000	No	PNL	25	0.19	0.45	0.29	(*S2)

TETRA TECH

Worst Case Arc Flash Results - In Service Mode - (Group 2) Settings

Burnaby Terminal
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Rev B - Issued For Review

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
MCC-LC-3 MAIN BK Line Side	LC3-MCC LINE Relay (50/51P)	0.48	7.94	7.61	4.39	0.5995	0.0830	Yes	PNL	25	1.55	0.45	8.9	(*N3) (*S2)
MCC-LC-4 MAIN BK Line Side	LC4-MCC LINE Relay (50/51P)	0.48	7.70	7.38	4.27	0.6413	0.0830	Yes	PNL	25	1.58	0.45	9.2	(*N3) (*S2)
MECH SHOP PANEL	MECH SHOP BKR	0.48	7.74	7.74	5.27	0.0177	0.0000	Yes	PNL	25	0.19	0.45	0.30	(*S2)
PDP #1	PDP1 FDR BK	0.48	6.01	5.89	4.16	0.0156	0.0000	No	PNL	25	0.18	0.45	0.27	(*S2)
PDP #3	PDP3/4 FDR BK	0.48	6.48	6.18	4.32	0.0154	0.0000	No	PNL	25	0.19	0.45	0.28	(*S2)
PDP #4	PDP3/4 FDR BK	0.48	6.43	6.14	4.29	0.0155	0.0000	No	PNL	25	0.19	0.45	0.28	(*S2)
PDP #5	PDP5 FDR BK	0.48	6.48	6.33	4.42	0.0153	0.0000	No	PNL	25	0.19	0.45	0.28	(*S2)
PDP #6	PDP6 FDR BK	0.48	6.65	6.55	4.56	0.0152	0.0000	No	PNL	25	0.19	0.45	0.29	(*S2)
PLM SHOP MCC	PLM SHOP BKR	0.48	7.76	7.67	5.22	0.0177	0.0000	Yes	PNL	25	0.20	0.45	0.30	(*S2)
T-3 Sec Side	LC3-MCC LINE Relay (50/51P)	0.48	8.01	7.68	4.42	0.5911	0.0830	Yes	PNL	25	1.54	0.45	8.9	(*N3) (*S3)
T-4 Sec Side	LC4-MCC LINE Relay (50/51P)	0.48	7.81	7.49	4.33	0.627	0.0830	Yes	PNL	25	1.57	0.45	9.1	(*N3) (*S3)
TK71 MAIN BK Line Side	LC 71 FDR BK	0.48	2.91	2.90	2.27	0.0193	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S3)
TK71 MCC	TK71 MAIN BK	0.48	2.91	2.90	2.27	0.0193	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S3)
TK72 MAIN BK Line Side	LC 72 FDR BK	0.48	2.77	2.76	2.18	0.0197	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S3)
TK72 MCC	TK72 MAIN BK	0.48	2.77	2.76	2.18	0.0197	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S3)
TK73 MAIN BK Line Side	LC 73 FDR BK	0.48	2.83	2.81	2.22	0.0171	0.0000	Yes	PNL	25	0.11	0.45	0.11	(*S3)
TK73 MCC	TK73 MAIN BK	0.48	2.83	2.81	2.22	0.0163	0.0000	Yes	PNL	25	0.10	0.45	0.11	(*S3)
TK74 MAIN BK Line Side	LC 74 FDR BK	0.48	2.32	2.31	1.88	2	0.0000	Yes	PNL	25	1.73	0.45	11	(*N9) (*S2)
TK74 MCC	TK74 MAIN BK	0.48	2.32	2.31	1.60	0.0279	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*N3) (*S2)
TK81 MAIN BK Line Side	LC 81 FDR BK	0.48	2.91	2.91	2.28	0.0192	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S3)
TK81 MCC	TK81 MAIN BK	0.48	2.91	2.91	2.28	0.0192	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S3)
TK82 MAIN BK Line Side	LC 82 FDR BK	0.48	3.14	3.14	2.44	0.0187	0.0000	Yes	PNL	25	0.12	0.45	0.14	(*S3)
TK82 MCC	TK82 MAIN BK	0.48	3.14	3.14	2.44	0.0187	0.0000	Yes	PNL	25	0.12	0.45	0.14	(*S3)
TK83 MAIN BK Line side	LC 83 FDR BK	0.48	3.94	3.94	2.96	0.0171	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S3)
TK83 MCC	TK83 MAIN BK	0.48	3.94	3.94	2.96	0.0171	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S3)
TK84 MAIN BK Line Side	LC 84 FDR BK	0.48	4.78	4.77	3.49	0.0163	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S3)

TETRA TECH

Worst Case Arc Flash Results - In Service Mode - (Group 2) Settings

Burnaby Terminal
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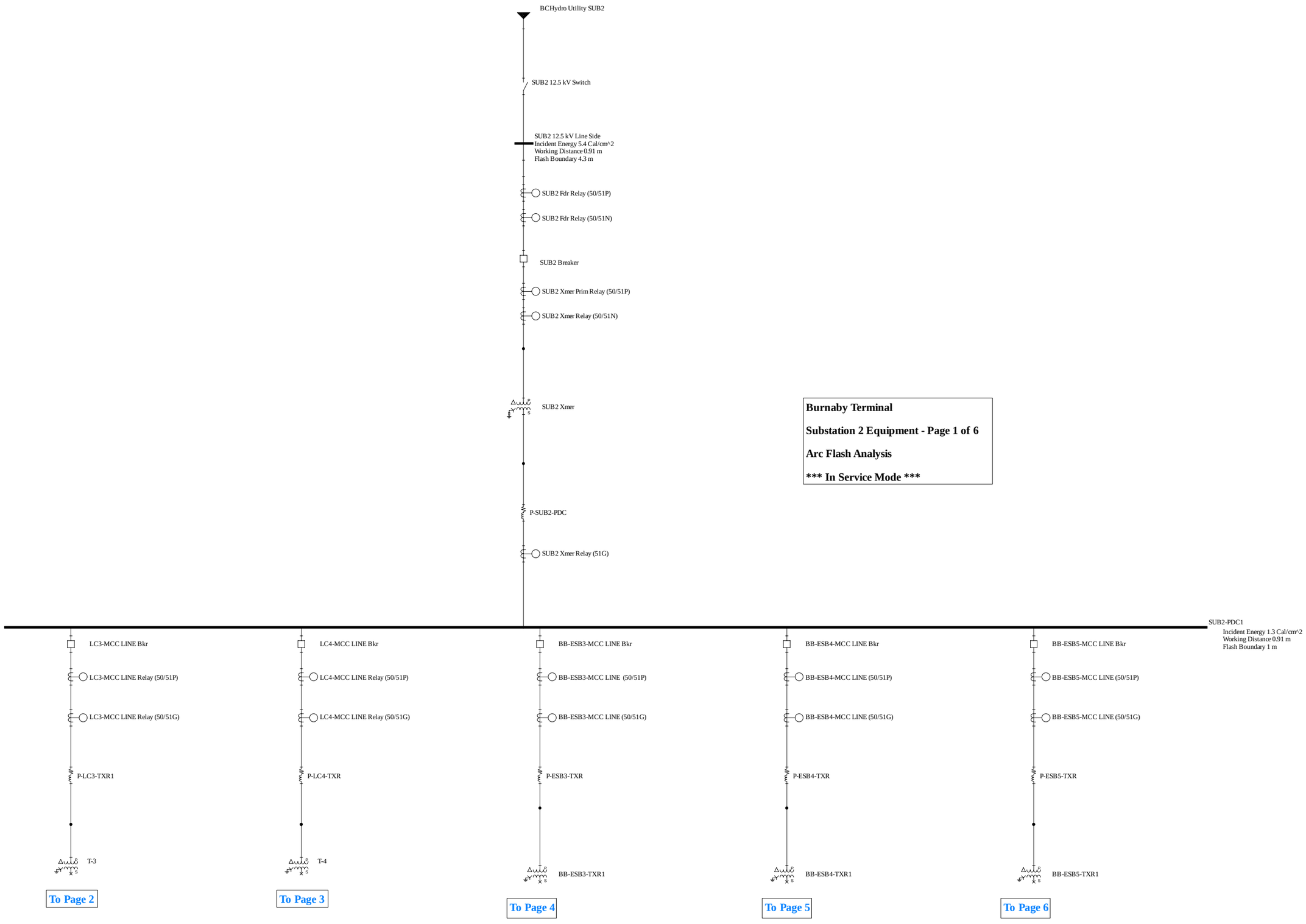
Rev B - Issued For Review

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
TK84 MCC	TK84 MAIN BK	0.48	4.78	4.77	3.49	0.0163	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S3)
TK85 MAIN BK Line Side	LC 85 FDR BK	0.48	6.37	6.36	4.45	0.0153	0.0000	Yes	PNL	25	0.16	0.45	0.21	(*S3)
TK85 MCC	TK85 MAIN BK	0.48	6.37	6.36	4.45	0.0153	0.0000	Yes	PNL	25	0.16	0.45	0.21	(*S3)
TK86 MAIN BK Line Side	LC 86 FDR BK	0.48	3.70	3.69	2.79	0.0176	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S3)
TK86 MCC	TK86 MAIN BK	0.48	3.70	3.69	2.79	0.0176	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S3)
TK87 MAIN BK Line Side	LC 87 FDR BK	0.48	2.83	2.81	1.89	0.0237	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*N3) (*S2)
TK87 MCC	TK87 MAIN BK	0.48	2.83	2.81	2.22	0.0181	0.0000	Yes	PNL	25	0.11	0.45	0.12	(*S3)
TK90/88 MAIN BK Line Side	LC 90/88 FDR BK	0.48	4.93	4.89	3.55	0.0175	0.0000	Yes	PNL	25	0.15	0.45	0.19	(*S3)
TK90/88 MCC	TK90/88 MAIN BK	0.48	4.93	4.89	3.55	0.0173	0.0000	Yes	PNL	25	0.15	0.45	0.19	(*S3)
TX-A Sec Side	SW-A	0.48	13.55	10.88	5.80	1.524	0.0000	No	PNL	25	3.62	0.45	35.96	(*N3) (*S3)
TX-B Sec Side	SW-B	0.48	12.97	10.78	5.79	1.534	0.0000	No	PNL	25	3.61	0.45	35.79	(*N3) (*S3)
TX-E Sec Side	SW-E	0.48	9.76	9.67	5.41	1.033	0.0000	Yes	PNL	25	2.27	0.45	16.71	(*N3) (*S3)

(*N1) - Out of IEEE 1584 Range; Lee Equation Used
(*N2) - <80% Cleared Fault Threshold
(*N3) - Arcing Current Low Tolerances Used
(*N5) - Miscoordinated, Upstream Device Tripped
(*N9) - Max Arcing Duration Reached
(*S2) - AF In Service Mode-1 jet fuel
(*S3) - AF In Service Mode-no jet fuel



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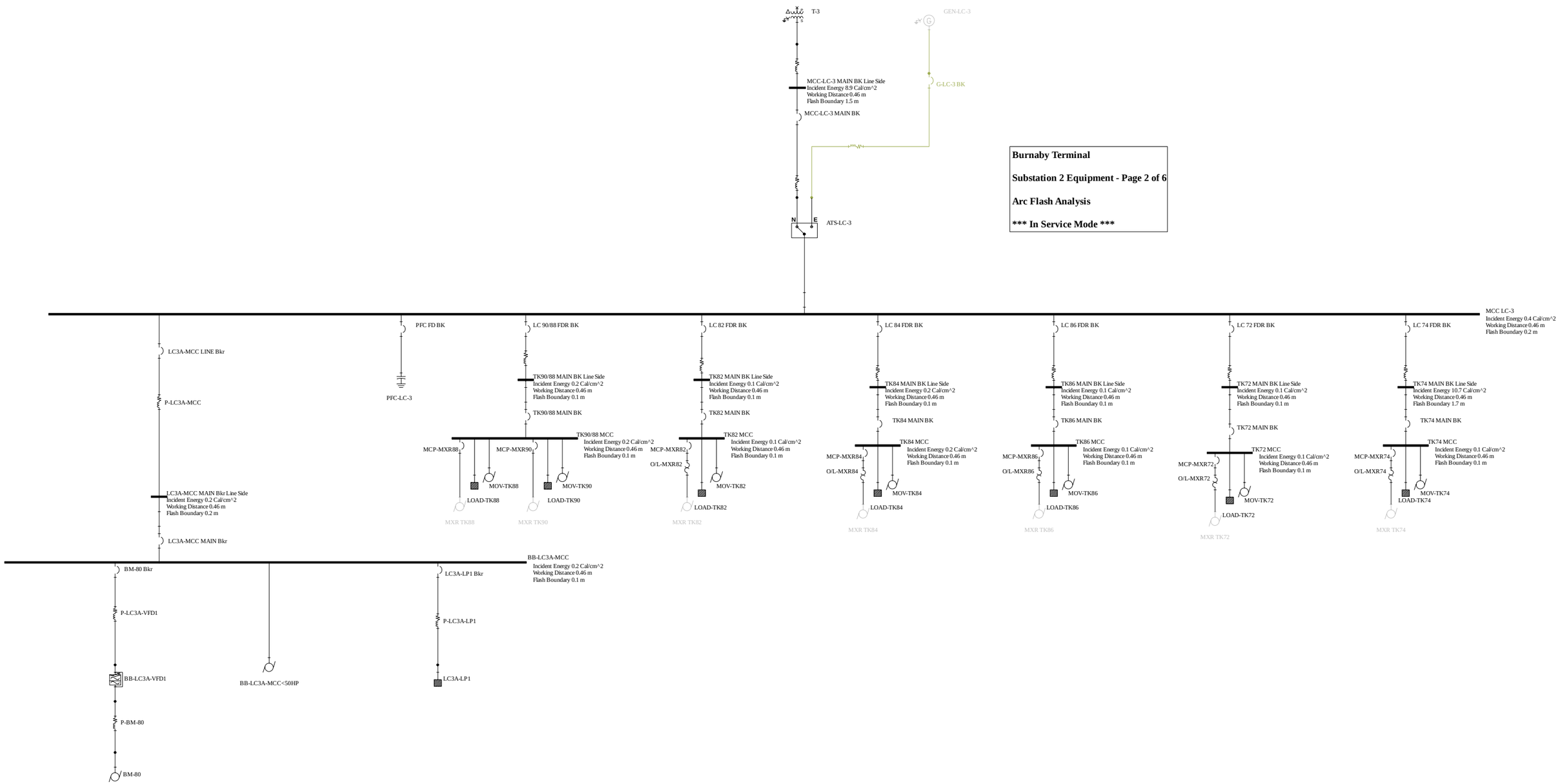
Arc Flash Analysis

***** In Service Mode *****

From Page 1



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Substation 2 Equipment - Page 2 of 6

Arc Flash Analysis

***** In Service Mode *****

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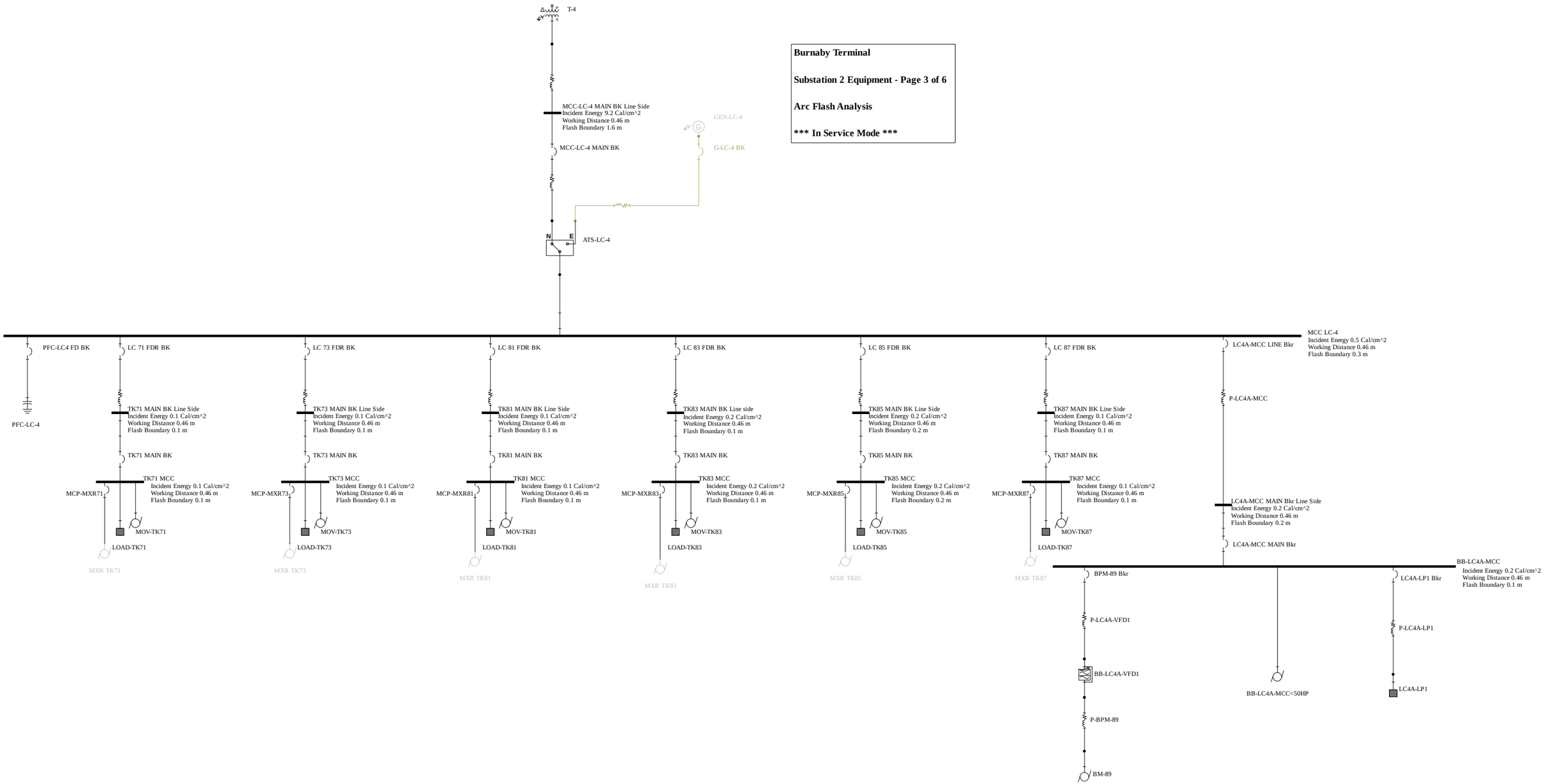
Arc Flash Analysis

***** In Service Mode *****



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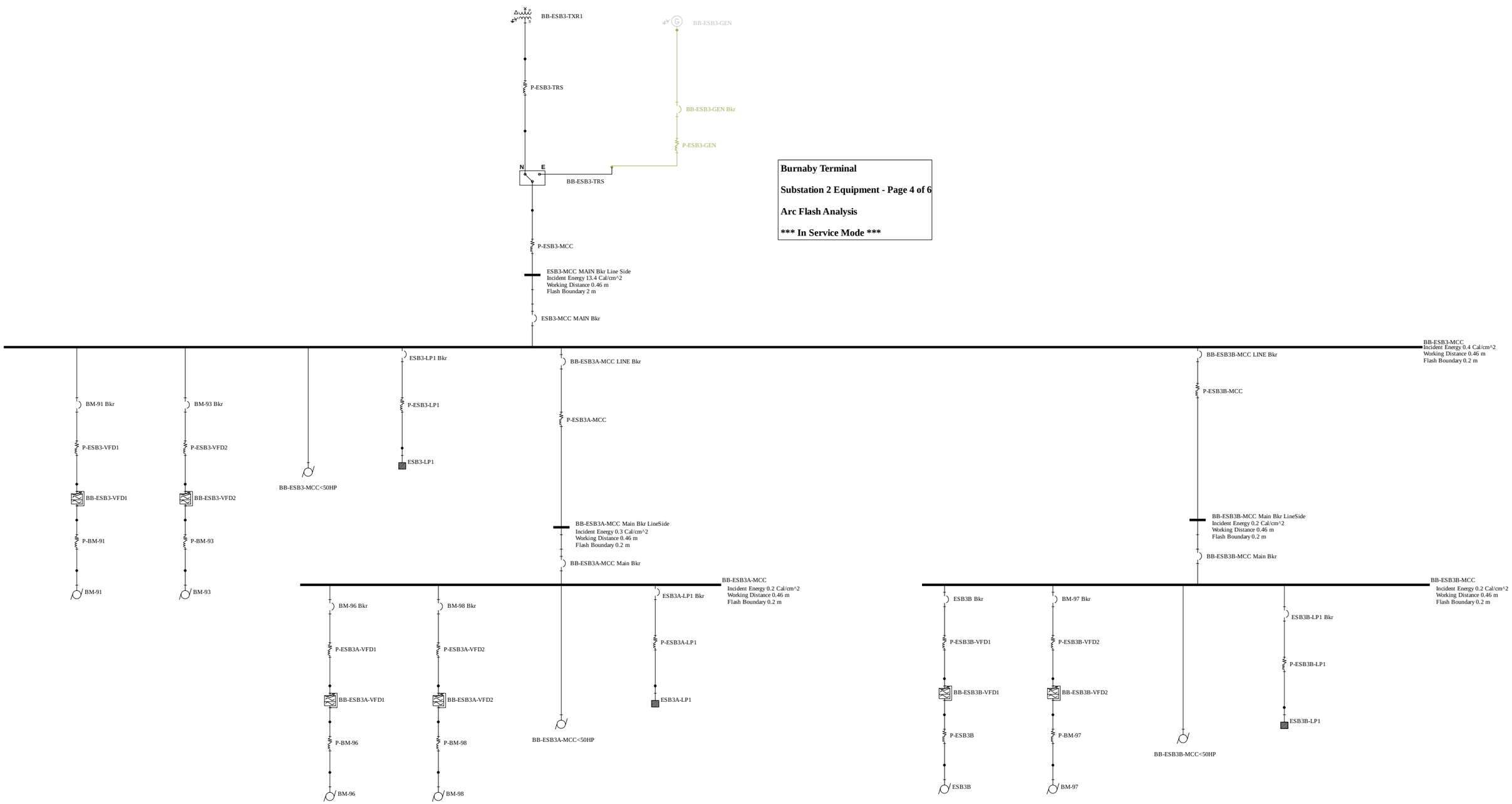


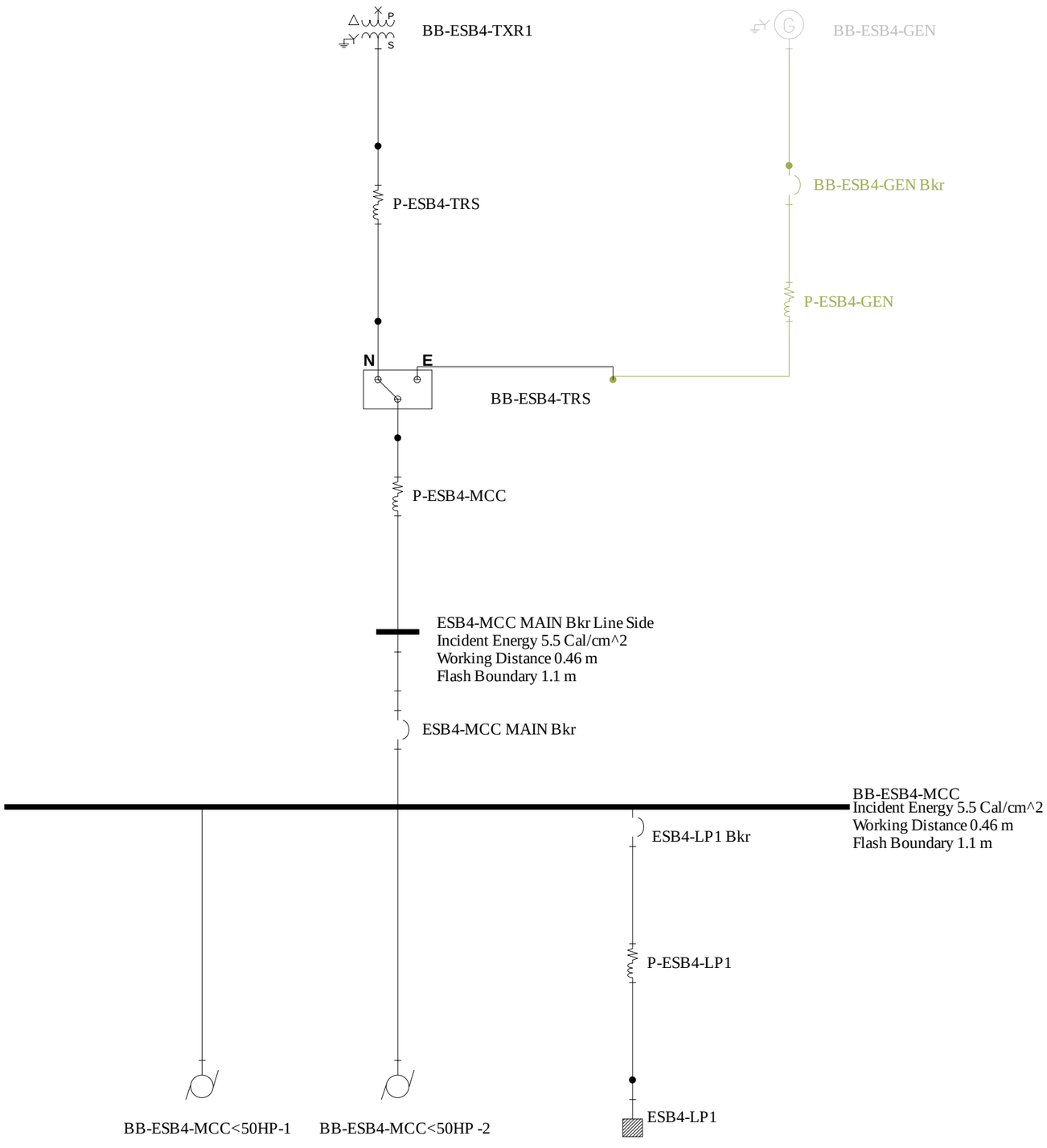
Burnaby Terminal

Substation 2 Equipment - Page 4 of 6

Arc Flash Analysis

***** In Service Mode *****

From Page 1



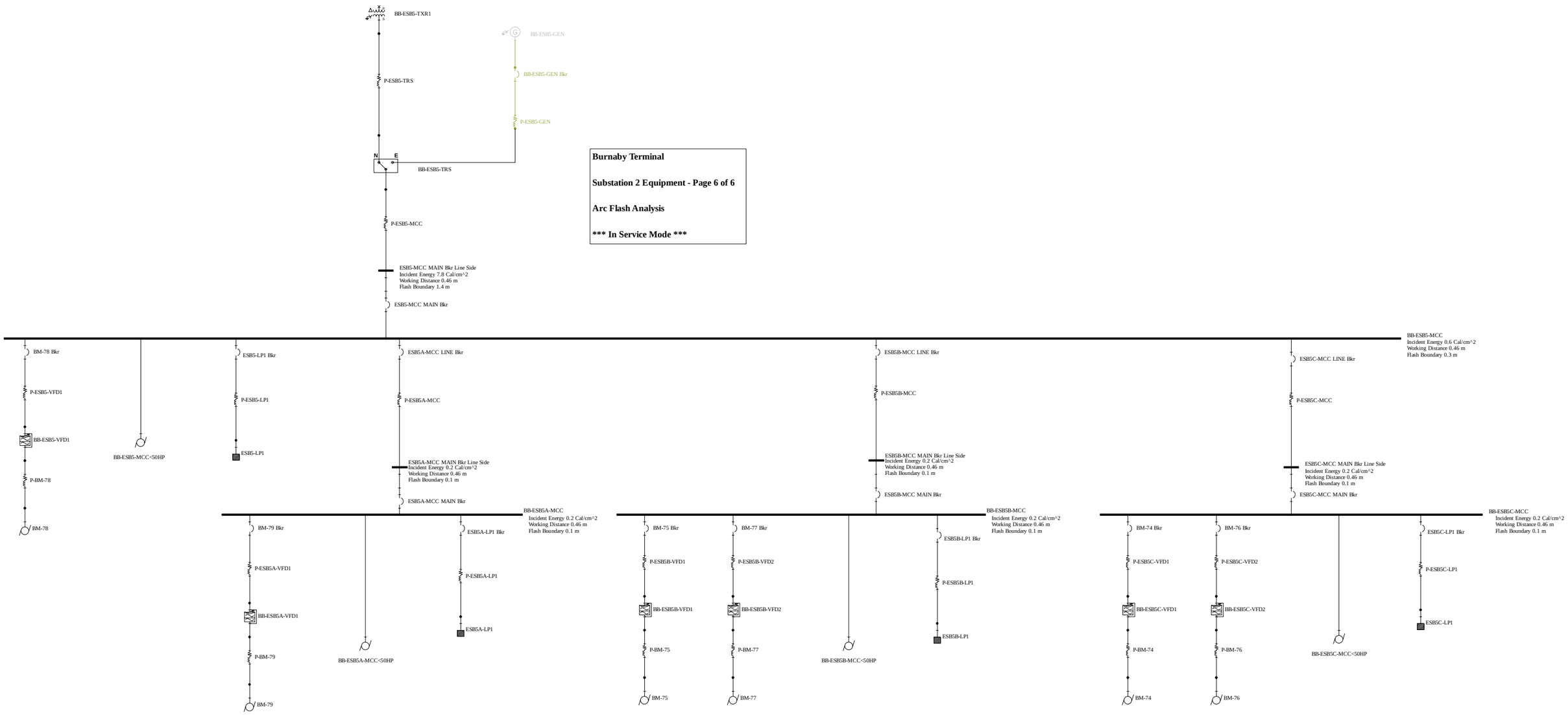
Burnaby Terminal

Substation 2 Equipment - Page 5 of 6

Arc Flash Analysis

***** In Service Mode *****

From Page 1



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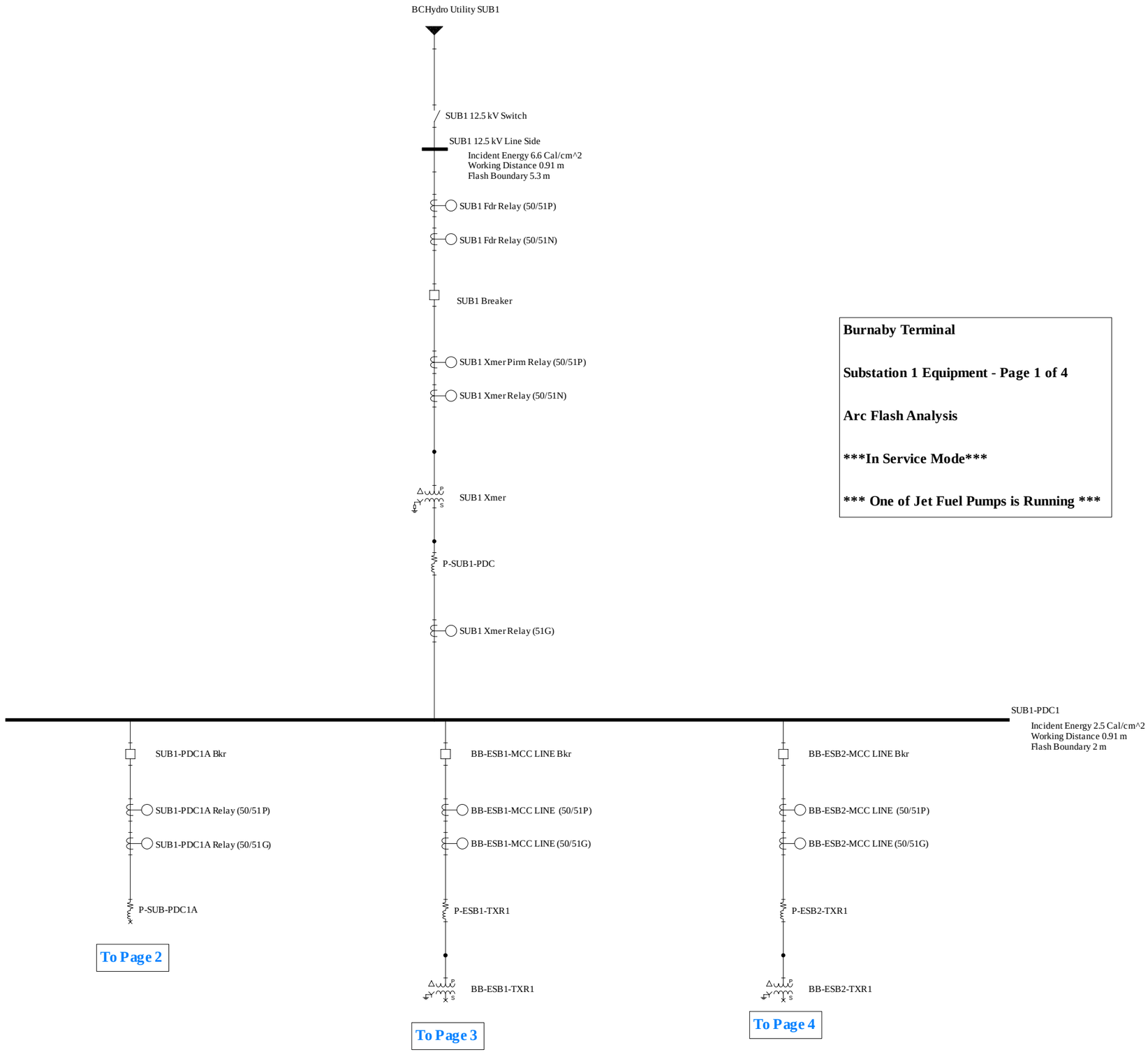
Arc Flash Analysis

***** In Service Mode *****



Burnaby Terminal

Substation 1 Equipment - Page 1 of 4

Arc Flash Analysis

*****In Service Mode*****

***** One of Jet Fuel Pumps is Running *****

Burnaby Terminal

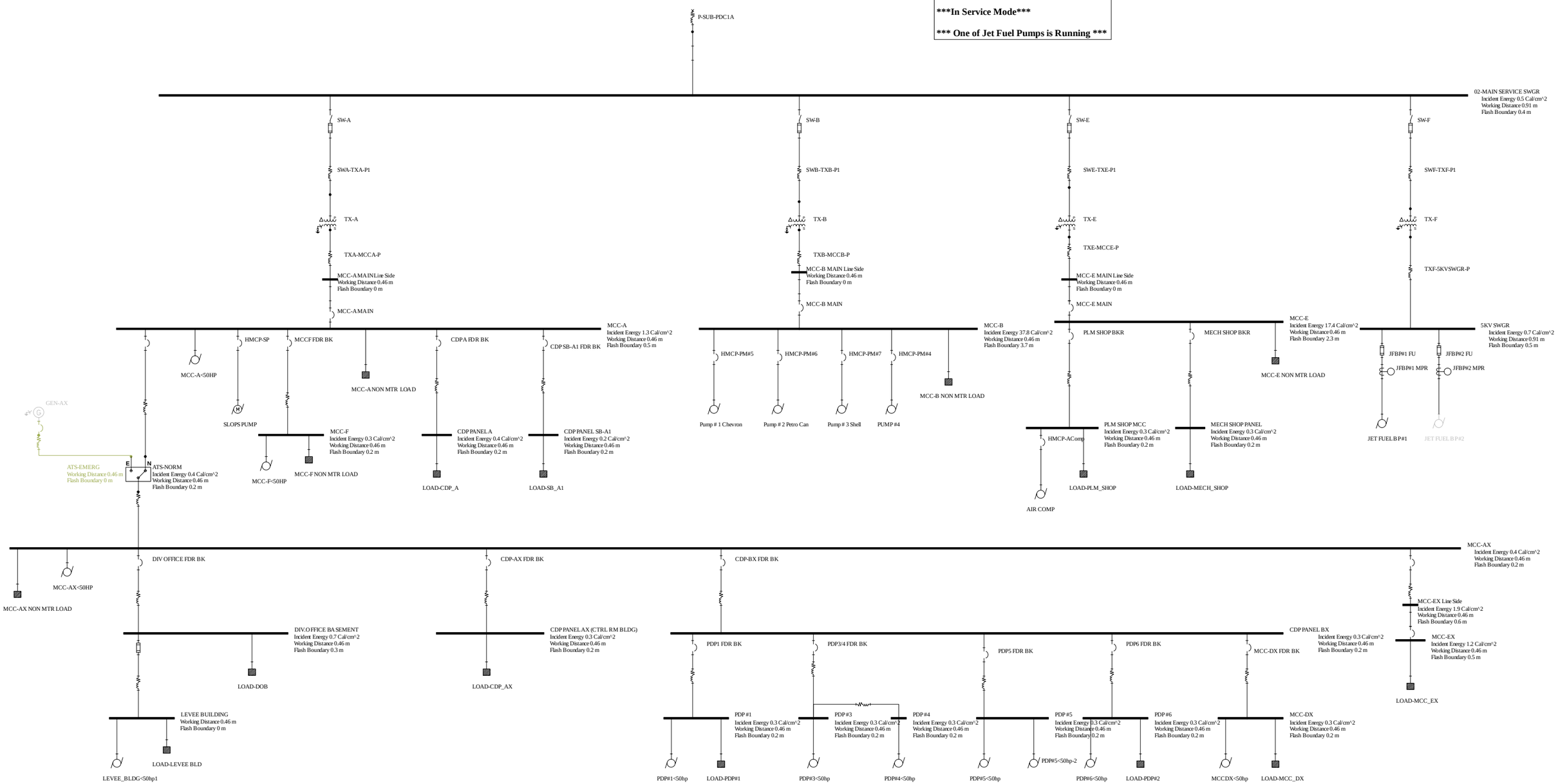
Substation 1 Equipment - Page 2 of 4

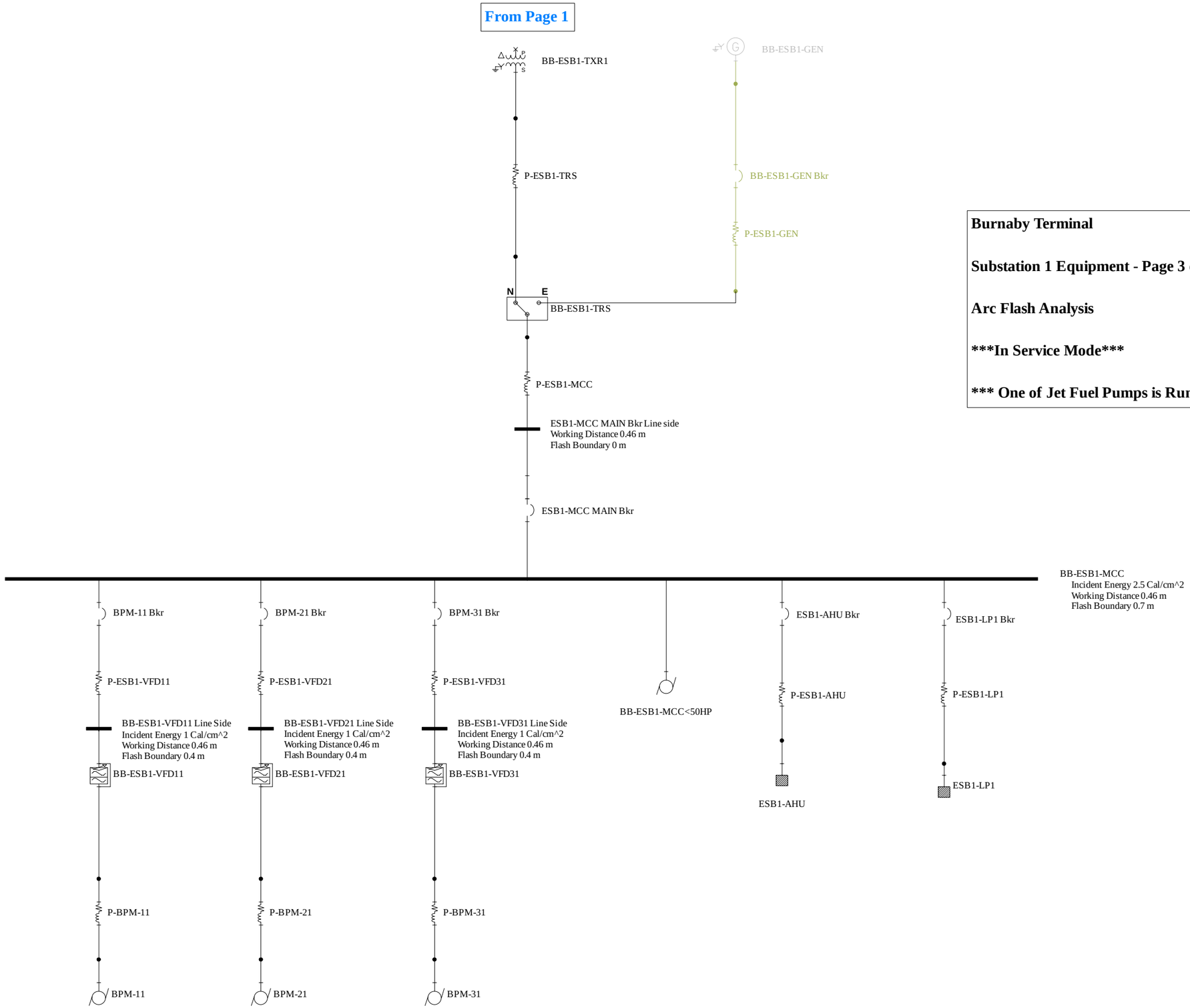
Arc Flash Analysis

*****In Service Mode*****

***** One of Jet Fuel Pumps is Running *****

From Page 1





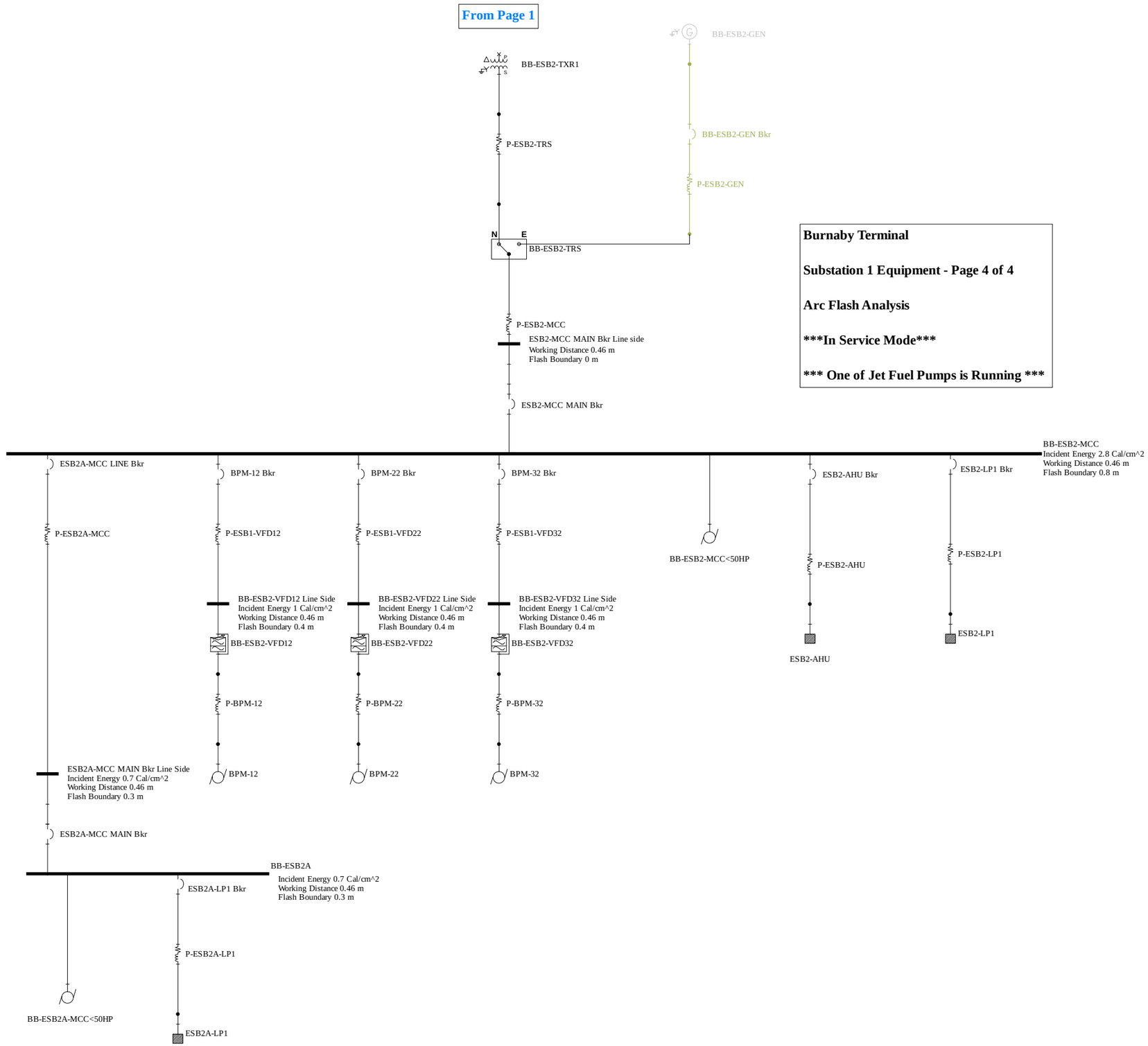
Burnaby Terminal

Substation 1 Equipment - Page 3 of 4

Arc Flash Analysis

*****In Service Mode*****

***** One of Jet Fuel Pumps is Running *****



Burnaby Terminal

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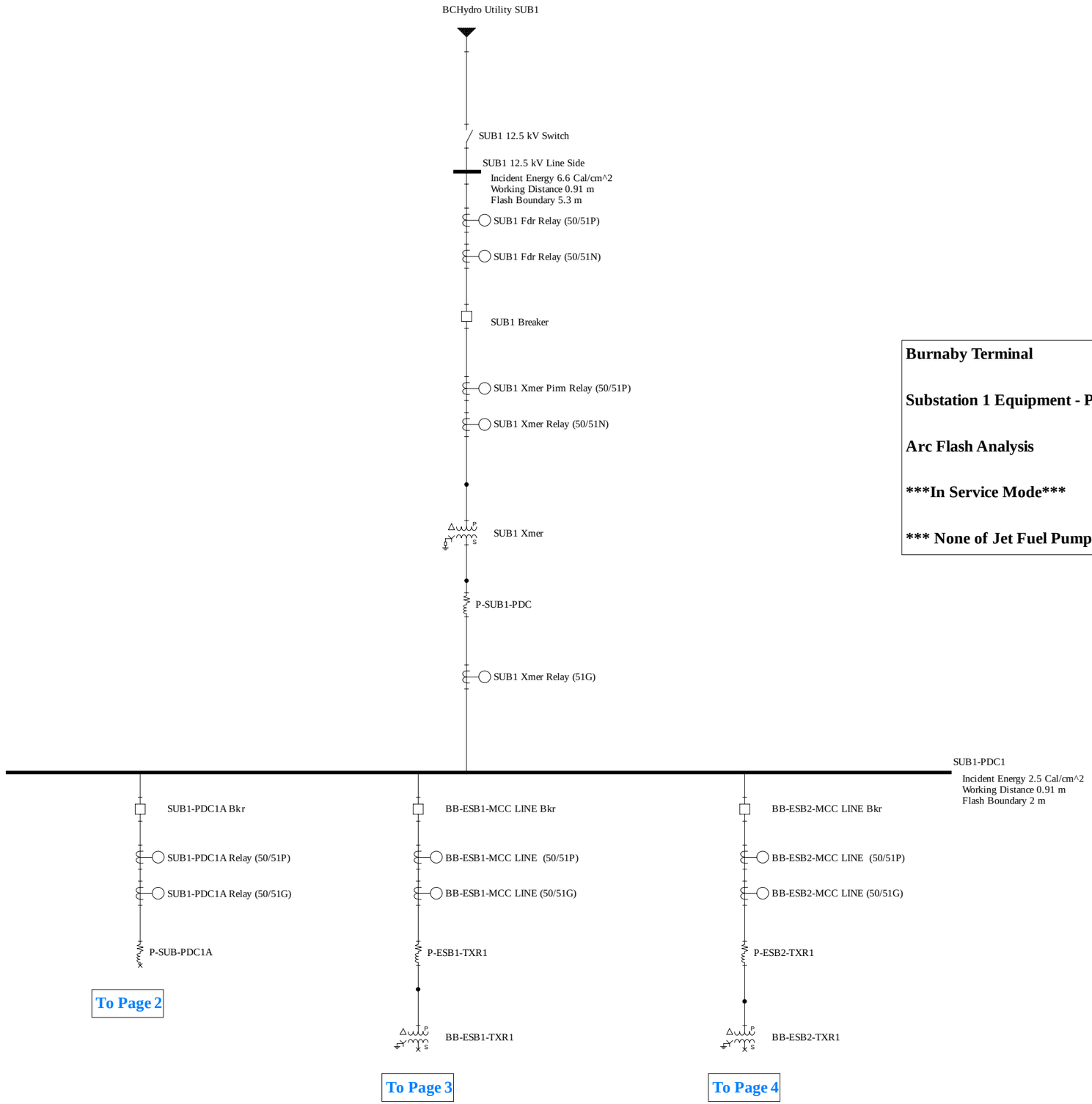
Arc Flash Analysis

*****In Service Mode*****

***** One of Jet Fuel Pumps is Running *****



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Arc Flash Analysis

*****In Service Mode*****

***** None of Jet Fuel Pumps is Running *****

Burnaby Terminal

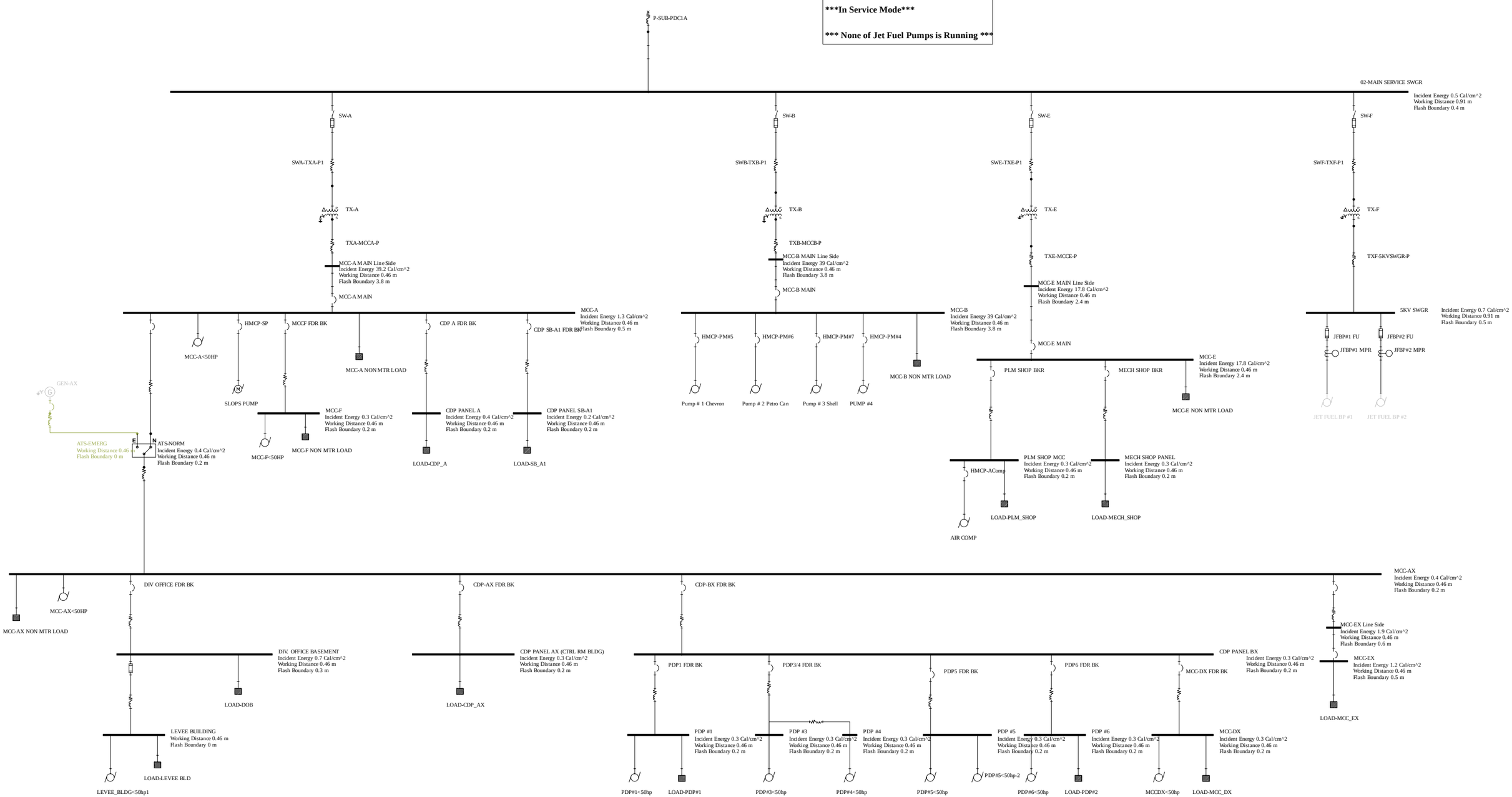
Substation 1 Equipment - Page 2 of 4

Arc Flash Analysis

*****In Service Mode*****

***** None of Jet Fuel Pumps is Running *****

From Page 1



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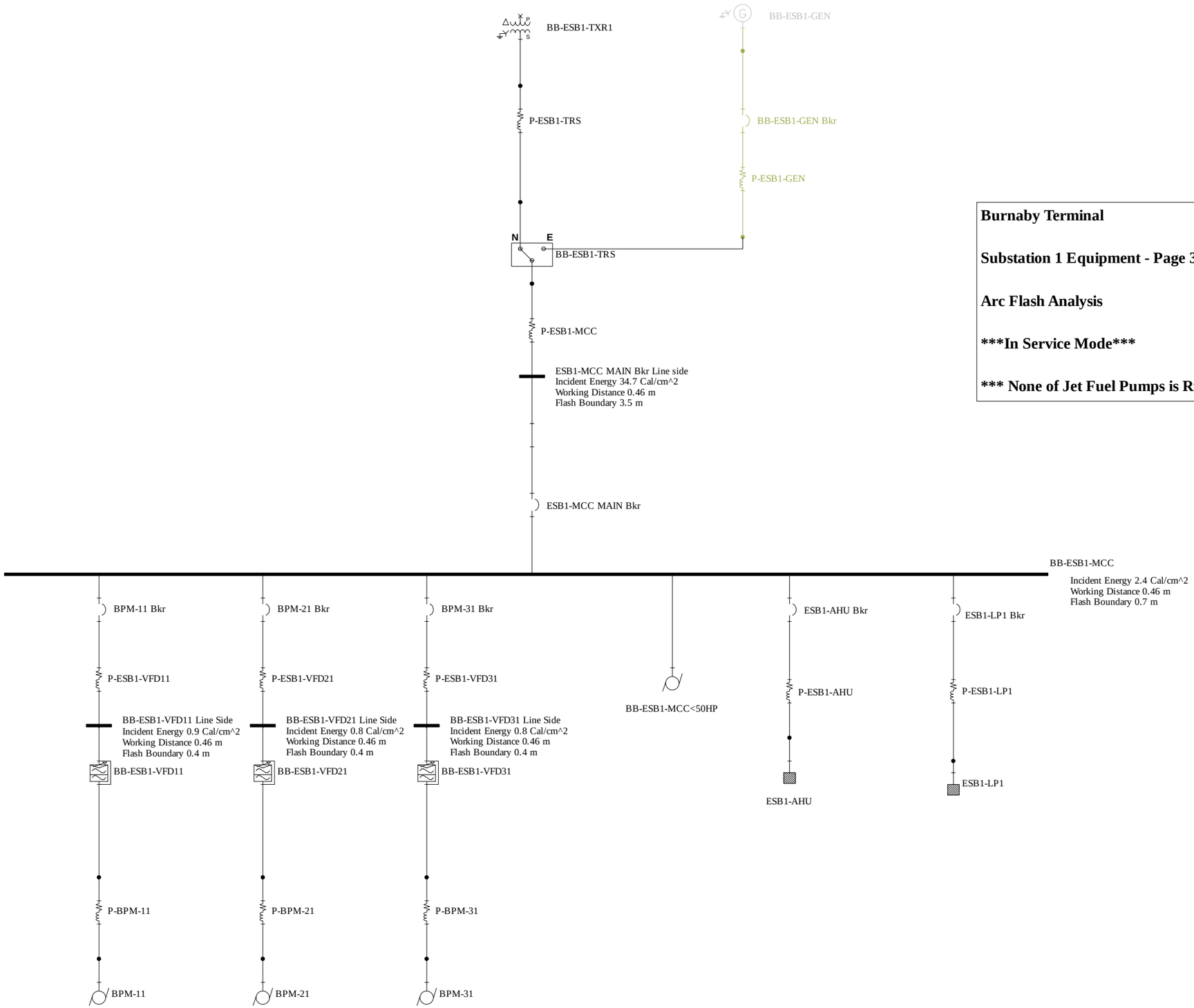

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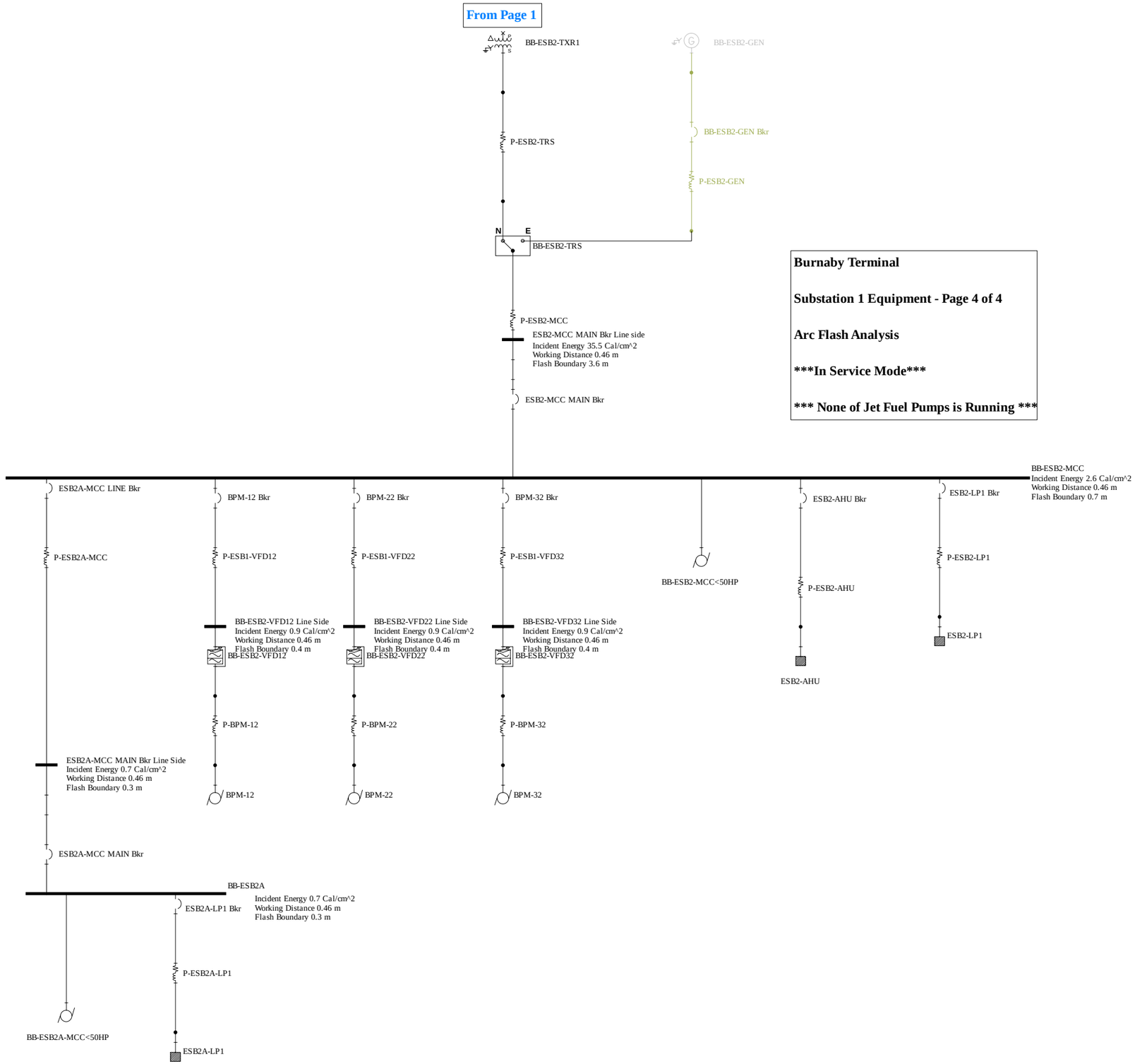
Arc Flash Analysis

*****In Service Mode*****

***** None of Jet Fuel Pumps is Running *****



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Substation 1 Equipment - Page 4 of 4

Arc Flash Analysis

*****In Service Mode*****

***** None of Jet Fuel Pumps is Running *****

TETRA TECH

Burnaby Terminal
216239
Rev B - Issued For Review

Worst Case Arc Flash Results - Maintenance Mode - (Group 1) Settings

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
02-MAIN SERVICE SWGR	SUB1-PDC1A Relay (50/51P)	12.47	2.17	1.90	1.89	0.0167	0.0830	No	SWG	152	0.22	0.91	0.30	(*S7)
BB-ESB1-TXR1 Prim Side	BB-ESB1-MCC LINE (50/51P)	12.47	2.06	1.84	1.84	0.0167	0.0830	No	SWG	152	0.21	0.91	0.29	(*S8)
BB-ESB2-TXR1 Prim Side	BB-ESB2-MCC LINE (50/51P)	12.47	2.07	1.81	1.80	0.0167	0.0830	No	SWG	152	0.21	0.91	0.29	(*S8)
SUB1 12.5 kV Line Side	MaxTripTime @2.0s	12.47	3.36	2.83	2.81	2	0.0000	Yes	SWG	152	5.26	0.91	6.6	(*S7)
SUB1 Xmer Prim Side	SUB1 Fdr Relay (50/51P)	12.47	3.31	2.83	2.38	0.3478	0.0830	Yes	SWG	152	0.93	0.91	1.2	(*N3) (*S8)
SUB1 Xmer Sec Side	SUB1 Fdr Relay (50/51P)	12.47	2.07	1.30	1.10	1.351	0.0830	No	SWG	152	1.96	0.91	2.5	(*N3) (*S8)
SUB1-PDC1	SUB1 Fdr Relay (50/51P)	12.47	2.17	1.30	1.10	1.356	0.0830	No	SWG	152	1.98	0.91	2.5	(*N3) (*S7)
SUB2 12.5 kV Line Side	MaxTripTime @2.0s	12.47	2.47	2.35	2.34	2	0.0000	Yes	SWG	152	4.27	0.91	5.4	(*N2) (*N9) (*S7)
SUB2 Xmer Prim Side	SUB2 Xmer Prim Relay (50/51P)	12.47	2.47	2.35	2.34	0.1612	0.0830	Yes	SWG	152	0.50	0.91	0.67	(*S8)
TX-A Prim Side	SW-A	12.47	2.16	2.07	2.06	0.0388	0.0000	No	SWG	152	0.09	0.91	0.12	(*S7)
TX-E Prim Side	SW-E	12.47	2.09	2.09	2.08	0.0329	0.0000	No	SWG	152	0.07	0.91	0.10	(*S7)
TX-B Prim Side	SW-B	12.47	2.17	2.09	2.09	0.0384	0.0000	No	SWG	152	0.09	0.91	0.12	(*S7)
TX-F Prim Side	SW-F	12.47	2.16	2.06	1.74	0.0906	0.0000	No	SWG	152	0.17	0.91	0.23	(*N3) (*S7)
5KV SWGR	SUB1-PDC1A Relay (50/51P)	4.16	2.53	2.03	2.01	0.0167	0.0830	Yes	SWG	104	0.18	0.91	0.25	(*N5) (*S7)
BB-ESB3-TXR1 Prim Side	BB-ESB3-MCC LINE (50/51P)	4.16	2.33	2.17	2.16	0.0167	0.0830	No	SWG	104	0.22	0.91	0.29	(*S8)
BB-ESB4-TXR1 Prim Side	BB-ESB4-MCC LINE (50/51P)	4.16	2.33	2.29	2.28	0.0646	0.0830	No	SWG	104	0.30	0.91	0.41	(*S7)
BB-ESB5-TXR1 Prim Side	BB-ESB5-MCC LINE (50/51P)	4.16	2.33	2.16	2.15	0.2018	0.0830	No	SWG	104	0.56	0.91	0.75	(*S7)
SUB2 Xmer Sec Side	SUB2 Xmer Prim Relay (50/51P)	4.16	2.34	1.91	1.62	0.5433	0.0830	No	SWG	104	1.02	0.91	1.3	(*N3) (*S8)
SUB2-PDC1	SUB2 Xmer Prim Relay (50/51P)	4.16	2.34	1.90	1.61	0.5473	0.0830	No	SWG	104	1.03	0.91	1.3	(*N3) (*S7)
T-3 Prim Side	LC3-MCC LINE Relay (50/51P)	4.16	2.33	2.29	2.28	0.1978	0.0830	No	SWG	104	0.55	0.91	0.74	(*S7)
T-4 Prim Side	LC4-MCC LINE Relay (50/51P)	4.16	2.33	2.29	2.28	0.2018	0.0830	No	SWG	104	0.56	0.91	0.75	(*S7)
TX-F Sec Side	SUB1-PDC1A Relay (50/51P)	4.16	2.54	2.04	2.02	0.0167	0.0830	Yes	SWG	104	0.18	0.91	0.25	(*N5) (*S7)
BB-ESB1-MCC	ESB1-MCC MAIN Bkr	0.60	20.74	14.85	11.02	0.03	0.0000	Yes	PNL	25	0.70	0.45	2.4	(*S7)
BB-ESB1-TXR1 Sec Side	BB-ESB1-MCC LINE (50/51P)	0.60	22.03	16.55	12.22	0.0167	0.0830	Yes	PNL	25	1.13	0.45	5.3	(*S8)

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Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
BB-ESB1-VFD11 Line Side	BPM-11 Bkr	0.60	18.39	16.85	12.62	0.0197	0.0000	Yes	PNL	25	0.39	0.45	0.93	(*S7)
BB-ESB1-VFD21 Line Side	BPM-21 Bkr	0.60	18.35	16.81	12.59	0.018	0.0000	Yes	PNL	25	0.37	0.45	0.85	(*S7)
BB-ESB1-VFD31 Line Side	BPM-31 Bkr	0.60	18.35	16.81	12.59	0.018	0.0000	Yes	PNL	25	0.37	0.45	0.85	(*S7)
BB-ESB2A	ESB2A-MCC MAIN Bkr	0.60	19.57	17.72	13.21	0.0141	0.0000	Yes	PNL	25	0.33	0.45	0.71	(*S7)
BB-ESB2-MCC	ESB2-MCC MAIN Bkr	0.60	21.71	14.76	10.92	0.03	0.0000	Yes	PNL	25	0.74	0.45	2.6	(*S7)
BB-ESB2-TXR1 Sec Side	BB-ESB2-MCC LINE (50/51P)	0.60	22.86	16.43	12.10	0.0167	0.0830	Yes	PNL	25	1.16	0.45	5.5	(*S8)
BB-ESB2-VFD12 Line Side	BPM-12 Bkr	0.60	19.09	17.55	13.11	0.0191	0.0000	Yes	PNL	25	0.39	0.45	0.94	(*S7)
BB-ESB2-VFD22 Line Side	BPM-22 Bkr	0.60	19.09	17.55	13.11	0.0179	0.0000	Yes	PNL	25	0.38	0.45	0.88	(*S7)
BB-ESB2-VFD32 Line Side	BPM-32 Bkr	0.60	19.09	17.55	13.11	0.0179	0.0000	Yes	PNL	25	0.38	0.45	0.88	(*S7)
BB-ESB3A-MCC	BB-ESB3A-MCC Main Bkr	0.60	6.19	5.83	4.76	0.0137	0.0000	Yes	PNL	25	0.16	0.45	0.22	(*S7)
BB-ESB3A-MCC Main Bkr LineSide	BB-ESB3A-MCC LINE Bkr	0.60	6.48	6.12	4.98	0.0169	0.0000	Yes	PNL	25	0.19	0.45	0.28	(*S8)
BB-ESB3B-MCC	BB-ESB3B-MCC Main Bkr	0.60	6.49	6.04	4.91	0.0135	0.0000	Yes	PNL	25	0.16	0.45	0.23	(*S7)
BB-ESB3B-MCC Main Bkr LineSide	BB-ESB3B-MCC LINE Bkr	0.60	6.49	6.04	4.91	0.0135	0.0000	Yes	PNL	25	0.16	0.45	0.23	(*S7)
BB-ESB3-MCC	ESB3-MCC MAIN Bkr	0.60	6.78	5.52	4.47	0.0254	0.0000	Yes	PNL	25	0.25	0.45	0.45	(*S7)
BB-ESB3-TXR1 Sec Side	BB-ESB3-MCC LINE (50/51P)	0.60	7.11	5.87	4.74	0.0167	0.0830	Yes	PNL	25	0.58	0.45	1.8	(*S8)
BB-ESB4-MCC	BB-ESB4-MCC LINE (50/51P)	0.60	1.88	1.58	1.20	1.515	0.0830	Yes	PNL	25	1.15	0.45	5.5	(*N3) (*N5) (*S7)
BB-ESB4-TXR1 Sec Side	BB-ESB4-MCC LINE (50/51P)	0.60	2.02	1.72	1.30	1.302	0.0830	Yes	PNL	25	1.11	0.45	5.1	(*N3) (*S7)
BB-ESB5A-MCC	ESB5A-MCC MAIN Bkr	0.60	5.50	5.32	4.38	0.0112	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S7)
BB-ESB5B-MCC	ESB5B-MCC MAIN Bkr	0.60	5.54	5.08	4.19	0.0114	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S7)
BB-ESB5C-MCC	ESB5C-MCC MAIN Bkr	0.60	5.54	5.08	4.19	0.0114	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S7)
BB-ESB5-MCC	ESB5-MCC MAIN Bkr	0.60	6.03	4.76	3.90	0.0281	0.0000	Yes	PNL	25	0.31	0.45	0.63	(*S7)
BB-ESB5-TXR1 Sec Side	BB-ESB5-MCC LINE (50/51P)	0.60	7.15	5.86	4.02	0.4804	0.0830	Yes	PNL	25	1.34	0.45	7.1	(*N3) (*S7)
ESB1-MCC MAIN Bkr Line side	BB-ESB1-MCC LINE (50/51P)	0.60	20.44	14.55	10.81	0.0167	0.0830	Yes	PNL	25	1.08	0.45	4.9	(*S8)
ESB2A-MCC MAIN Bkr Line Side	ESB2A-MCC LINE Bkr	0.60	19.57	17.72	13.21	0.0141	0.0000	Yes	PNL	25	0.33	0.45	0.71	(*S7)

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Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
ESB2-MCC MAIN Bkr Line side	BB-ESB2-MCC LINE (50/51P)	0.60	21.41	14.45	10.70	0.0167	0.0830	Yes	PNL	25	1.11	0.45	5.1	(*S8)
ESB3-MCC MAIN Bkr Line Side	BB-ESB3-MCC LINE (50/51P)	0.60	6.78	5.52	4.47	0.0167	0.0830	Yes	PNL	25	0.56	0.45	1.7	(*S8)
ESB4-MCC MAIN Bkr Line Side	BB-ESB4-MCC LINE (50/51P)	0.60	1.88	1.58	1.20	1.515	0.0830	Yes	PNL	25	1.15	0.45	5.5	(*N3) (*S7)
ESB5A-MCC MAIN Bkr Line Side	ESB5A-MCC LINE Bkr	0.60	5.51	5.33	4.39	0.0112	0.0000	Yes	PNL	25	0.13	0.45	0.16	(*S7)
ESB5B-MCC MAIN Bkr Line Side	ESB5B-MCC LINE Bkr	0.60	5.54	5.09	4.19	0.0114	0.0000	Yes	PNL	25	0.14	0.45	0.16	(*S7)
ESB5C-MCC MAIN Bkr Line Side	ESB5C-MCC LINE Bkr	0.60	5.54	5.09	4.19	0.0127	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S7)
ESB5-MCC MAIN Bkr Line Side	BB-ESB5-MCC LINE (50/51P)	0.60	6.03	4.76	3.31	0.6789	0.0830	Yes	PNL	25	1.43	0.45	7.8	(*N3) (*S7)
BB-LC3A-MCC	LC3A-MCC MAIN Bkr	0.48	6.86	6.65	4.61	0.0121	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S7)
BB-LC4A-MCC	LC4A-MCC MAIN Bkr	0.48	5.84	5.62	3.98	0.0128	0.0000	Yes	PNL	25	0.14	0.45	0.17	(*S7)
CDP PANEL A	CDP A FDR BK	0.48	7.34	7.34	5.04	0.0192	0.0000	No	PNL	25	0.23	0.45	0.40	(*S7)
CDP PANEL AX (CTRL RM BLDG)	CDP-AX FDR BK	0.48	5.81	5.81	4.13	0.0156	0.0000	No	PNL	25	0.18	0.45	0.26	(*S7)
CDP PANEL BX	CDP-BX FDR BK	0.48	6.87	5.54	3.84	0.0166	0.0000	No	PNL	25	0.20	0.45	0.32	(*S7)
CDP PANEL SB-A1	CDP SB-A1 FDR BK	0.48	4.47	4.47	3.30	0.0168	0.0000	No	PNL	25	0.16	0.45	0.22	(*S7)
DIV. OFFICE BASEMENT	DIV OFFICE FDR BK	0.48	1.64	1.63	1.18	0.1676	0.0000	No	PNL	25	0.33	0.45	0.71	(*N3) (*S8)
LC3A-MCC MAIN Bkr Line Side	LC3A-MCC LINE Bkr	0.48	6.86	6.65	4.61	0.0135	0.0000	Yes	PNL	25	0.15	0.45	0.20	(*S7)
LC4A-MCC MAIN Bkr Line Side	LC4A-MCC LINE Bkr	0.48	6.69	6.46	4.49	0.0135	0.0000	Yes	PNL	25	0.15	0.45	0.20	(*S7)
LEVEE BUILDING	LEVEE BLDG FDR FU	0.48	0.86	0.85	0.80	0.01	0.0000	No	PNL	25	0.05	0.45	0.03	(*S7)
MCC LC-3	MCC-LC-3 MAIN BK	0.48	7.86	7.53	5.12	0.0222	0.0000	Yes	PNL	25	0.22	0.45	0.38	(*S7)
MCC LC-4	MCC-LC-4 MAIN BK	0.48	7.63	7.31	4.98	0.0225	0.0000	Yes	PNL	25	0.22	0.45	0.37	(*S7)
MCC-A	MCC-A MAIN	0.48	12.80	9.99	6.32	0.0233	0.0000	No	PNL	25	0.48	0.45	1.3	(*S7)
MCC-A MAIN Line Side	SUB1-PDC1A Relay (50/51P)	0.48	13.00	10.29	6.49	0.0167	0.0830	No	PNL	25	0.85	0.45	3.4	(*N5) (*S8)
MCC-AX	ATS FDR BK	0.48	11.30	9.68	6.24	0.0129	0.0000	No	PNL	25	0.23	0.45	0.40	(*S7)
MCC-B	SUB1-PDC1A Relay (50/51P)	0.48	12.50	9.35	5.04	0.0167	0.0830	No	PNL	25	0.75	0.45	2.7	(*N3) (*N5) (*S7)
MCC-B MAIN Line Side	SUB1-PDC1A Relay (50/51P)	0.48	12.40	10.20	6.48	0.0167	0.0830	No	PNL	25	0.83	0.45	3.2	(*N5) (*S8)

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Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
MCC-DX	MCC-DX FDR BK	0.48	6.20	5.57	3.91	0.0162	0.0000	No	PNL	25	0.19	0.45	0.29	(*S7)
MCC-E	SUB1-PDC1A Relay (50/51P)	0.48	9.20	8.00	4.51	0.0167	0.0830	Yes	PNL	25	0.55	0.45	1.6	(*N3) (*N5) (*S7)
MCC-E MAIN Line Side	SUB1-PDC1A Relay (50/51P)	0.48	9.12	8.34	5.54	0.0167	0.0830	Yes	PNL	25	0.61	0.45	1.9	(*N5) (*S8)
MCC-EX	MCC-EX FDR BK	0.48	0.57	0.57	0.57	1.814	0.0000	No	PNL	25	0.46	0.45	1.2	(*N5) (*S8)
MCC-EX Line Side	MCC-EX FDR BK	0.48	1.10	1.10	0.84	0.6517	0.0000	No	PNL	25	0.61	0.45	1.9	(*N3) (*S8)
MCC-F	MCCF FDR BK	0.48	9.09	9.06	6.03	0.0116	0.0000	No	PNL	25	0.19	0.45	0.29	(*S7)
MCC-LC-3 MAIN BK Line Side	LC3-MCC LINE Relay (50/51P)	0.48	7.94	7.61	4.39	0.5995	0.0830	Yes	PNL	25	1.55	0.45	8.9	(*N3) (*S7)
MCC-LC-4 MAIN BK Line Side	LC4-MCC LINE Relay (50/51P)	0.48	7.70	7.38	4.27	0.6413	0.0830	Yes	PNL	25	1.58	0.45	9.2	(*N3) (*S7)
MECH SHOP PANEL	MECH SHOP BKR	0.48	7.72	7.72	5.26	0.0177	0.0000	Yes	PNL	25	0.19	0.45	0.30	(*S7)
PDP #1	PDP1 FDR BK	0.48	6.14	6.02	4.24	0.0155	0.0000	No	PNL	25	0.18	0.45	0.27	(*S7)
PDP #3	PDP3/4 FDR BK	0.48	6.62	6.31	4.40	0.0154	0.0000	No	PNL	25	0.19	0.45	0.29	(*S7)
PDP #4	PDP3/4 FDR BK	0.48	6.57	6.27	4.37	0.0154	0.0000	No	PNL	25	0.19	0.45	0.29	(*S7)
PDP #5	PDP5 FDR BK	0.48	6.61	6.46	4.50	0.0153	0.0000	No	PNL	25	0.19	0.45	0.29	(*S7)
PDP #6	PDP6 FDR BK	0.48	6.79	6.69	4.64	0.0151	0.0000	No	PNL	25	0.19	0.45	0.29	(*S7)
PLM SHOP MCC	PLM SHOP BKR	0.48	7.74	7.66	5.21	0.0177	0.0000	Yes	PNL	25	0.19	0.45	0.30	(*S7)
T-3 Sec Side	LC3-MCC LINE Relay (50/51P)	0.48	8.01	7.68	4.42	0.5911	0.0830	Yes	PNL	25	1.54	0.45	8.9	(*N3) (*S7)
T-4 Sec Side	LC4-MCC LINE Relay (50/51P)	0.48	7.81	7.49	4.33	0.627	0.0830	Yes	PNL	25	1.57	0.45	9.1	(*N3) (*S7)
TK71 MAIN BK Line Side	LC 71 FDR BK	0.48	2.91	2.90	2.27	0.0193	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S7)
TK71 MCC	TK71 MAIN BK	0.48	2.91	2.90	2.27	0.0193	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S7)
TK72 MAIN BK Line Side	LC 72 FDR BK	0.48	2.77	2.76	2.18	0.0197	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S7)
TK72 MCC	TK72 MAIN BK	0.48	2.77	2.76	2.18	0.0197	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S7)
TK73 MAIN BK Line Side	LC 73 FDR BK	0.48	2.83	2.81	2.22	0.0171	0.0000	Yes	PNL	25	0.11	0.45	0.11	(*S7)
TK73 MCC	TK73 MAIN BK	0.48	2.83	2.81	2.22	0.0163	0.0000	Yes	PNL	25	0.10	0.45	0.11	(*S7)
TK74 MAIN BK Line Side	LC 74 FDR BK	0.48	2.32	2.31	1.88	2	0.0000	Yes	PNL	25	1.73	0.45	11	(*N9) (*S7)

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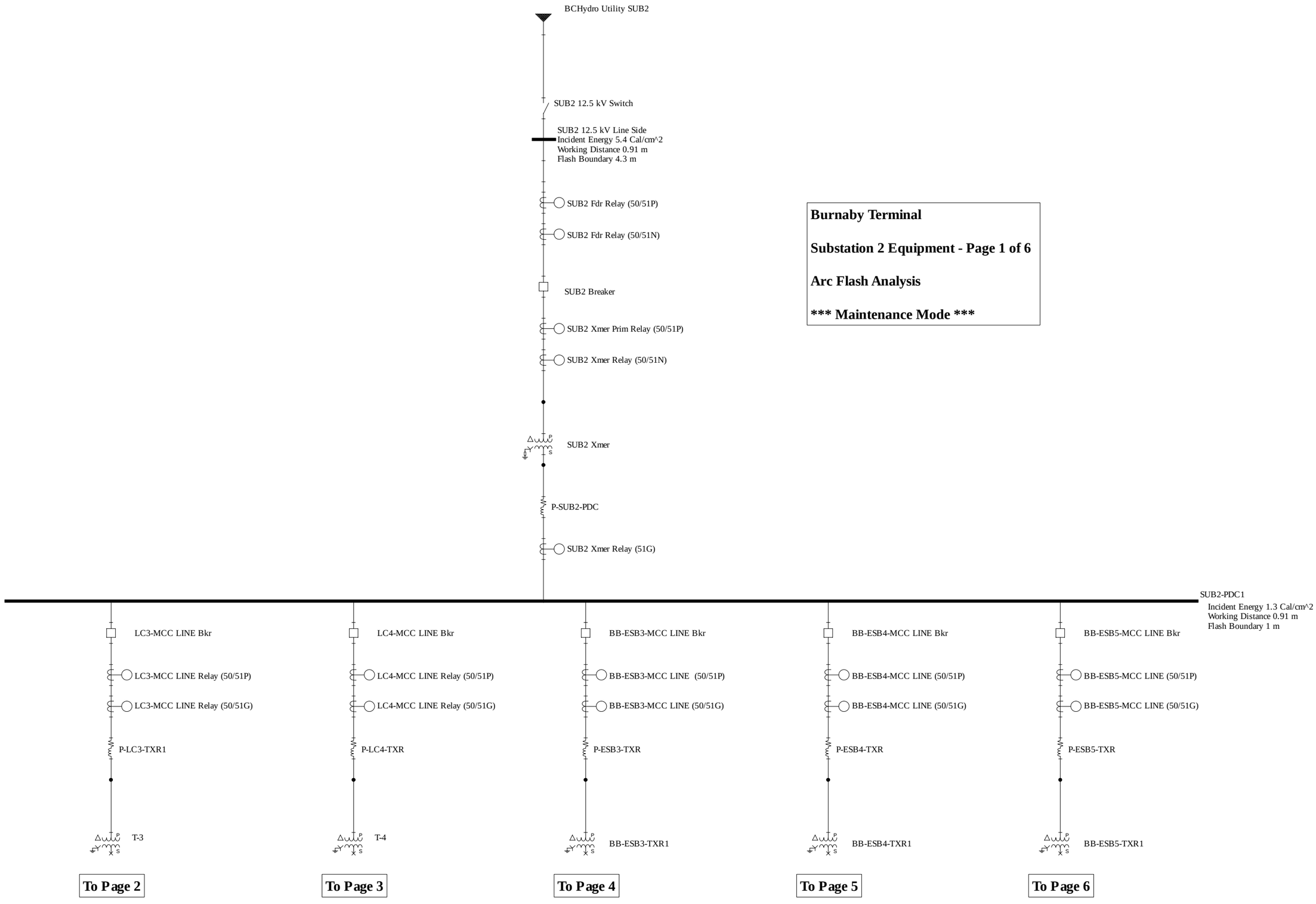
Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
TK74 MCC	TK74 MAIN BK	0.48	2.32	2.31	1.60	0.0279	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*N3) (*S7)
TK81 MAIN BK Line Side	LC 81 FDR BK	0.48	2.91	2.91	2.28	0.0192	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S7)
TK81 MCC	TK81 MAIN BK	0.48	2.91	2.91	2.28	0.0192	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*S7)
TK82 MAIN BK Line Side	LC 82 FDR BK	0.48	3.14	3.14	2.44	0.0187	0.0000	Yes	PNL	25	0.12	0.45	0.14	(*S7)
TK82 MCC	TK82 MAIN BK	0.48	3.14	3.14	2.44	0.0187	0.0000	Yes	PNL	25	0.12	0.45	0.14	(*S7)
TK83 MAIN BK Line side	LC 83 FDR BK	0.48	3.94	3.94	2.96	0.0171	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S7)
TK83 MCC	TK83 MAIN BK	0.48	3.94	3.94	2.96	0.0171	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S7)
TK84 MAIN BK Line Side	LC 84 FDR BK	0.48	4.78	4.77	3.49	0.0163	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S7)
TK84 MCC	TK84 MAIN BK	0.48	4.78	4.77	3.49	0.0163	0.0000	Yes	PNL	25	0.14	0.45	0.18	(*S7)
TK85 MAIN BK Line Side	LC 85 FDR BK	0.48	6.37	6.36	4.45	0.0153	0.0000	Yes	PNL	25	0.16	0.45	0.21	(*S7)
TK85 MCC	TK85 MAIN BK	0.48	6.37	6.36	4.45	0.0153	0.0000	Yes	PNL	25	0.16	0.45	0.21	(*S7)
TK86 MAIN BK Line Side	LC 86 FDR BK	0.48	3.70	3.69	2.79	0.0176	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S7)
TK86 MCC	TK86 MAIN BK	0.48	3.70	3.69	2.79	0.0176	0.0000	Yes	PNL	25	0.13	0.45	0.15	(*S7)
TK87 MAIN BK Line Side	LC 87 FDR BK	0.48	2.83	2.81	1.89	0.0237	0.0000	Yes	PNL	25	0.12	0.45	0.13	(*N3) (*S7)
TK87 MCC	TK87 MAIN BK	0.48	2.83	2.81	2.22	0.0181	0.0000	Yes	PNL	25	0.11	0.45	0.12	(*S7)
TK90/88 MAIN BK Line Side	LC 90/88 FDR BK	0.48	4.93	4.89	3.55	0.0175	0.0000	Yes	PNL	25	0.15	0.45	0.19	(*S7)
TK90/88 MCC	TK90/88 MAIN BK	0.48	4.93	4.89	3.55	0.0173	0.0000	Yes	PNL	25	0.15	0.45	0.19	(*S7)
TX-A Sec Side	SUB1-PDC1A Relay (50/51P)	0.48	13.89	10.47	6.54	0.0167	0.0830	No	PNL	25	0.89	0.45	3.56	(*N5) (*S7)
TX-B Sec Side	SUB1-PDC1A Relay (50/51P)	0.48	13.08	9.89	6.23	0.0167	0.0830	No	PNL	25	0.86	0.45	3.38	(*N5) (*S7)
TX-E Sec Side	SUB1-PDC1A Relay (50/51P)	0.48	9.84	8.57	5.63	0.0167	0.0830	Yes	PNL	25	0.63	0.45	2.05	(*N5) (*S7)

(*N1) - Out of IEEE 1584 Range; Lee Equation Used
(*N2) - <80% Cleared Fault Threshold
(*N3) - Arcing Current Low Tolerances Used
(*N5) - Miscoordinated, Upstream Device Tripped
(*N9) - Max Arcing Duration Reached
(*S7) - AF Maintenance Mode -1 jet fuel
(*S8) - AF Maintenance Mode-no jet fuel



Burnaby Terminal

Substation 2 Equipment - Page 1 of 6

Arc Flash Analysis

***** Maintenance Mode *****

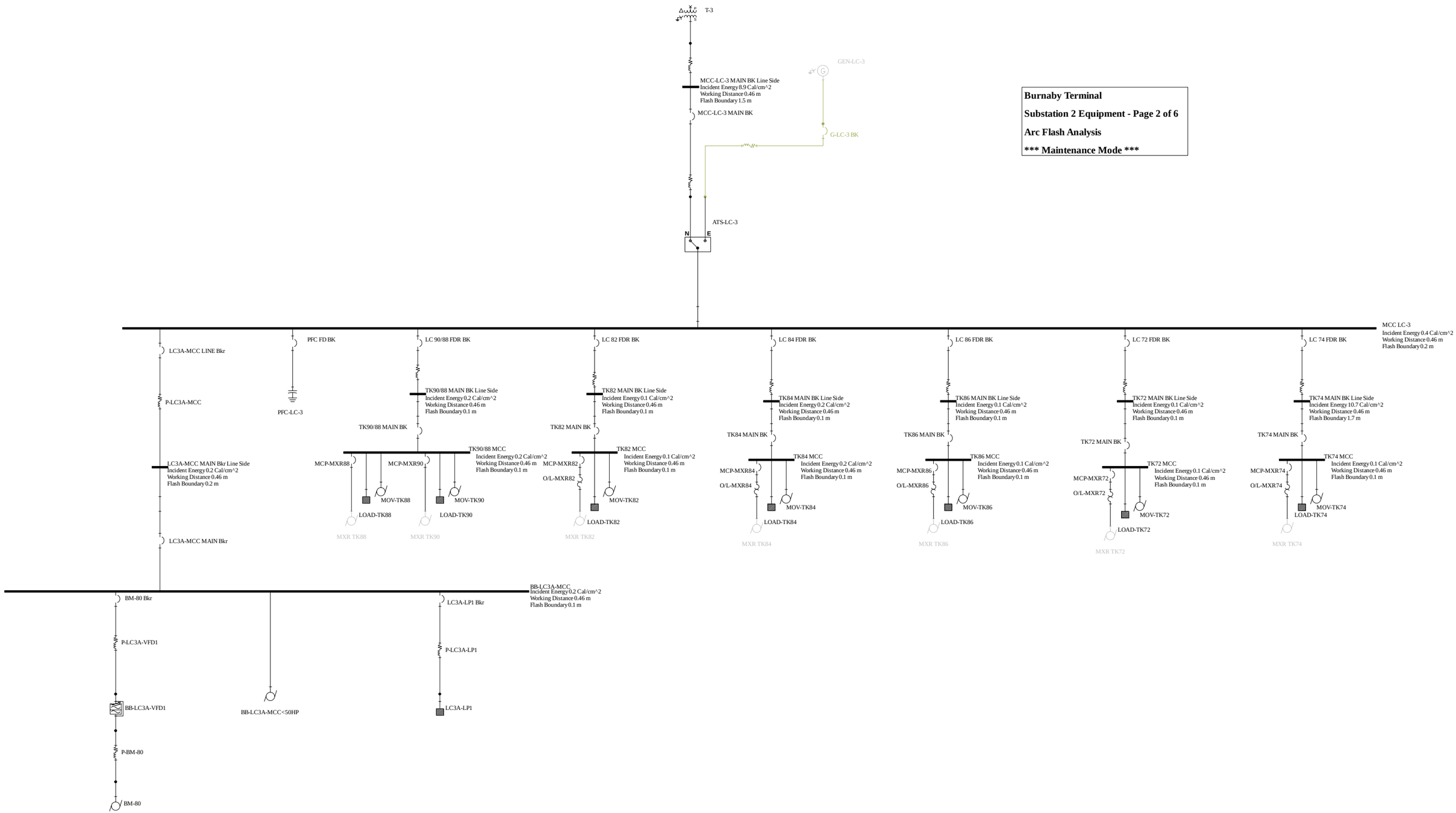
From Page 1

Burnaby Terminal

Substation 2 Equipment - Page 2 of 6

Arc Flash Analysis

***** Maintenance Mode *****



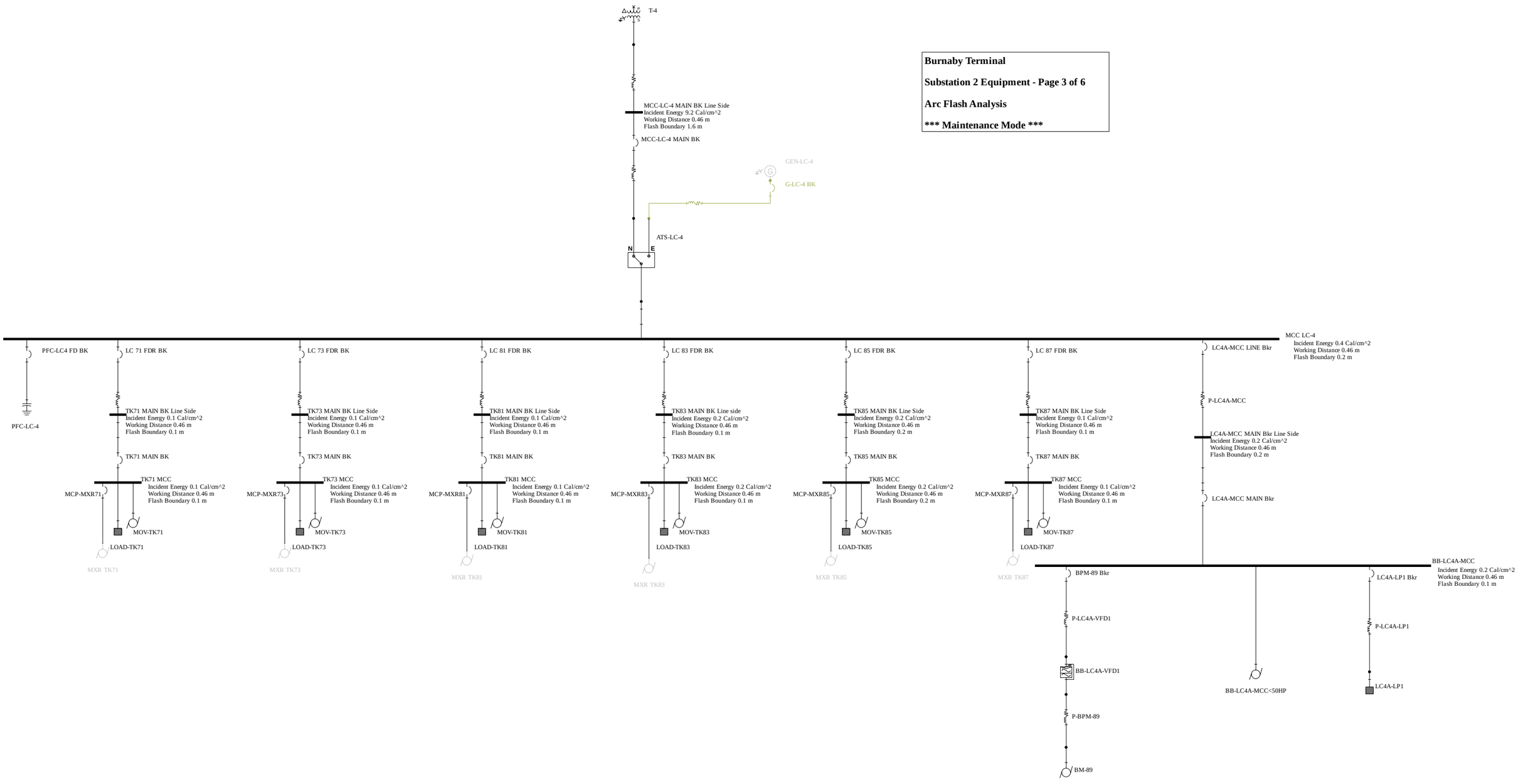
From Page 1

Burnaby Terminal

Substation 2 Equipment - Page 3 of 6

Arc Flash Analysis

***** Maintenance Mode *****



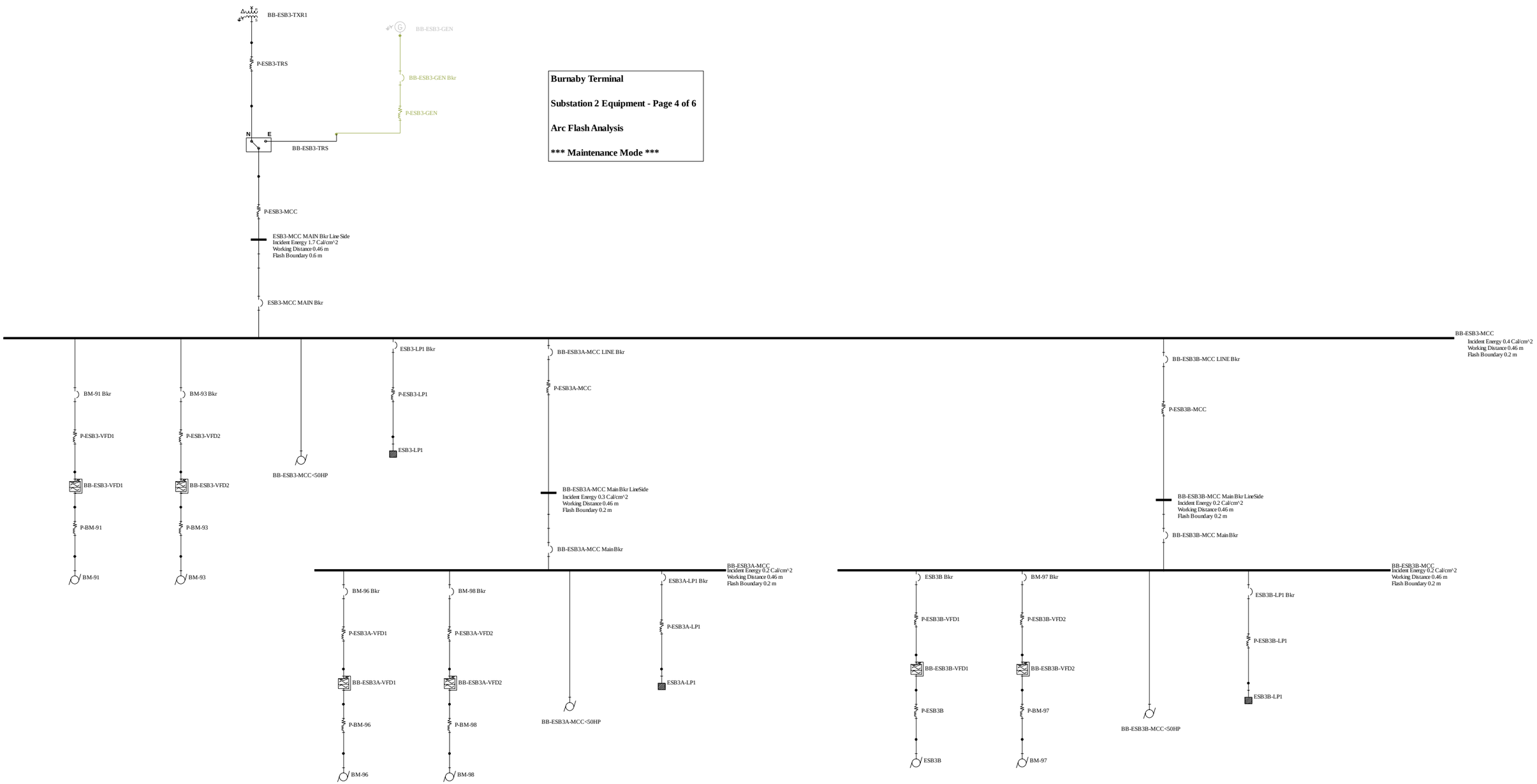
From Page 1

Burnaby Terminal

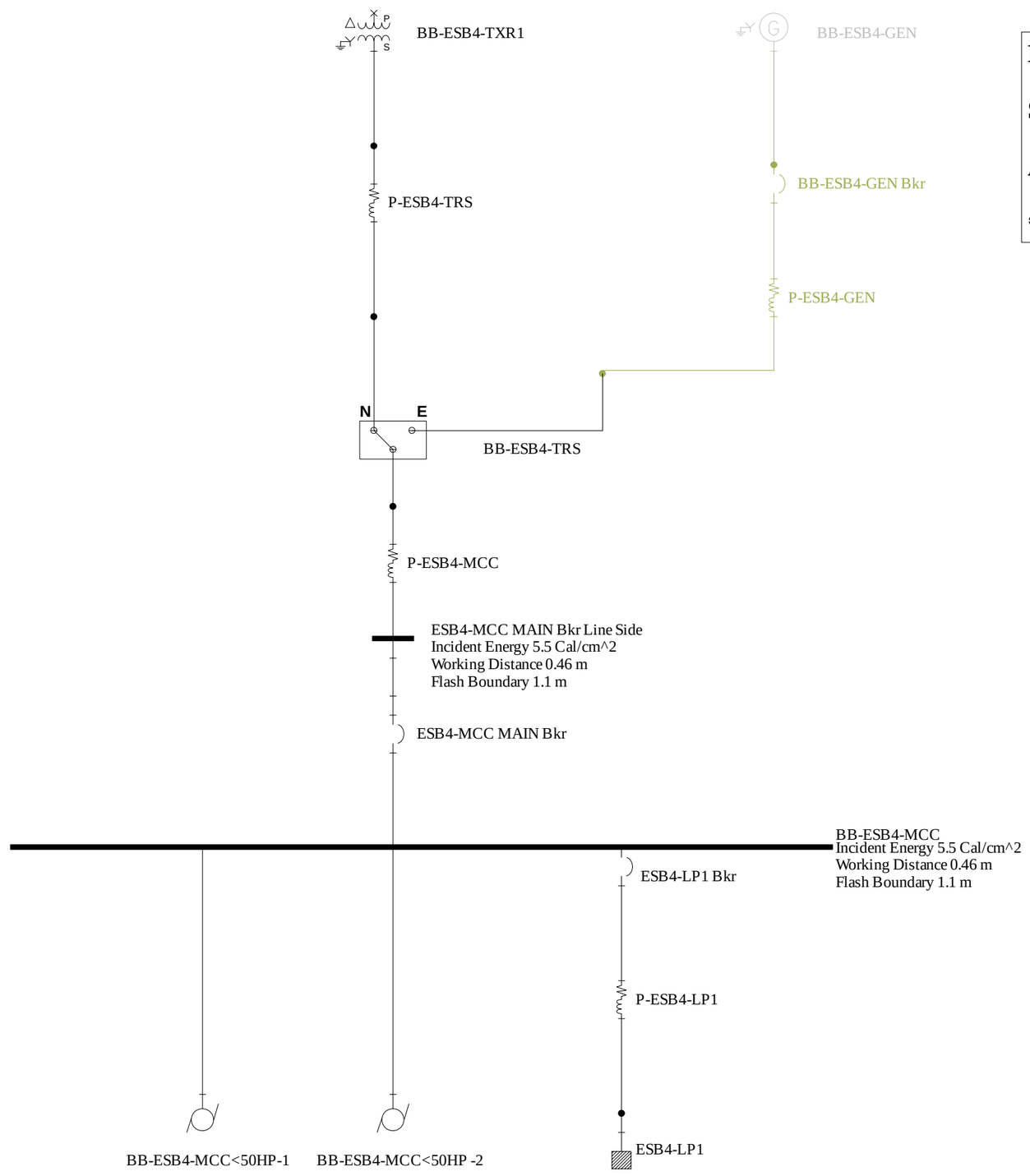
Substation 2 Equipment - Page 4 of 6

Arc Flash Analysis

***** Maintenance Mode *****



From Page 1



Burnaby Terminal

Substation 2 Equipment - Page 5 of 6

Arc Flash Analysis

***** Maintenance Mode *****

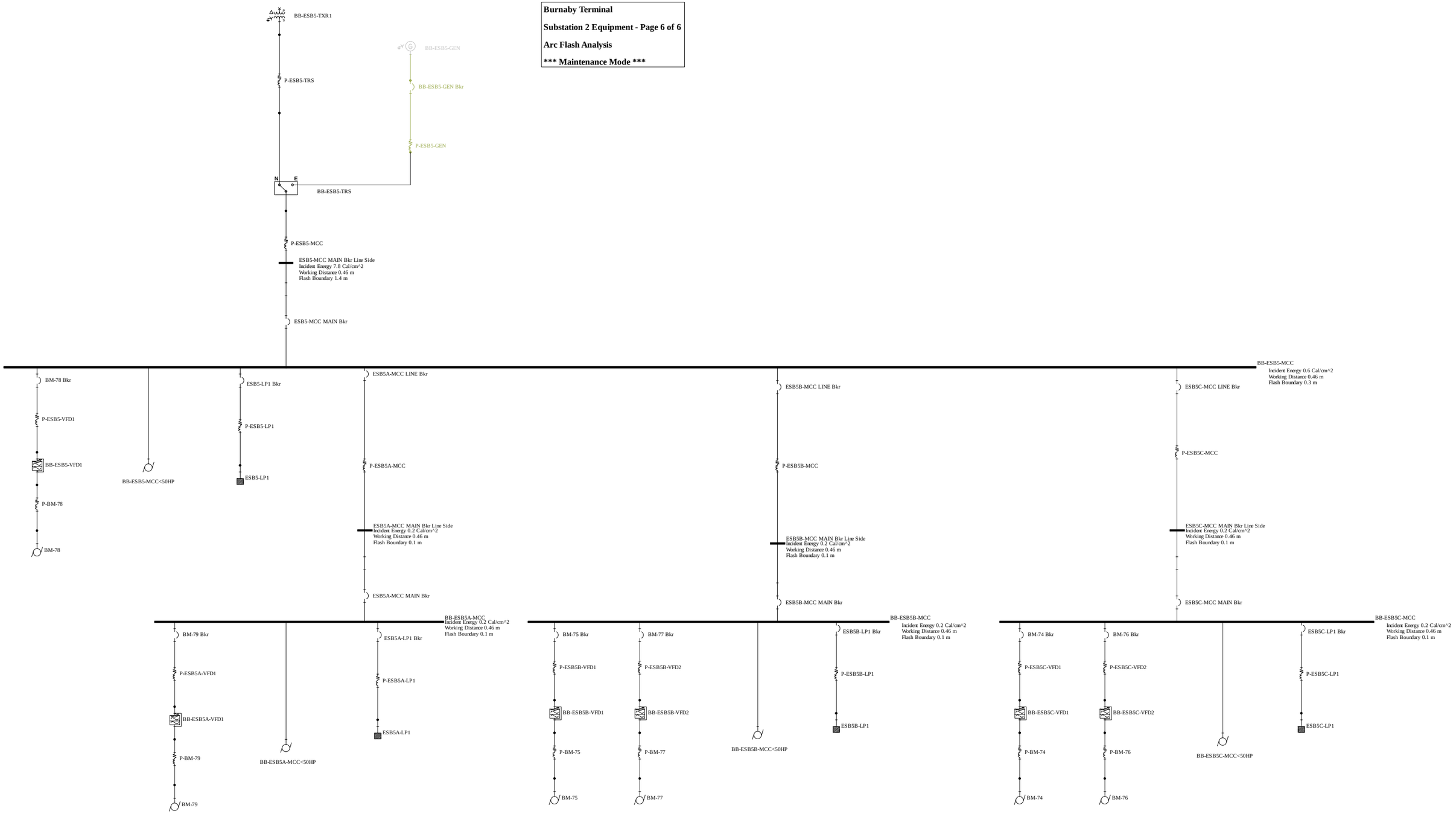
From Page 1

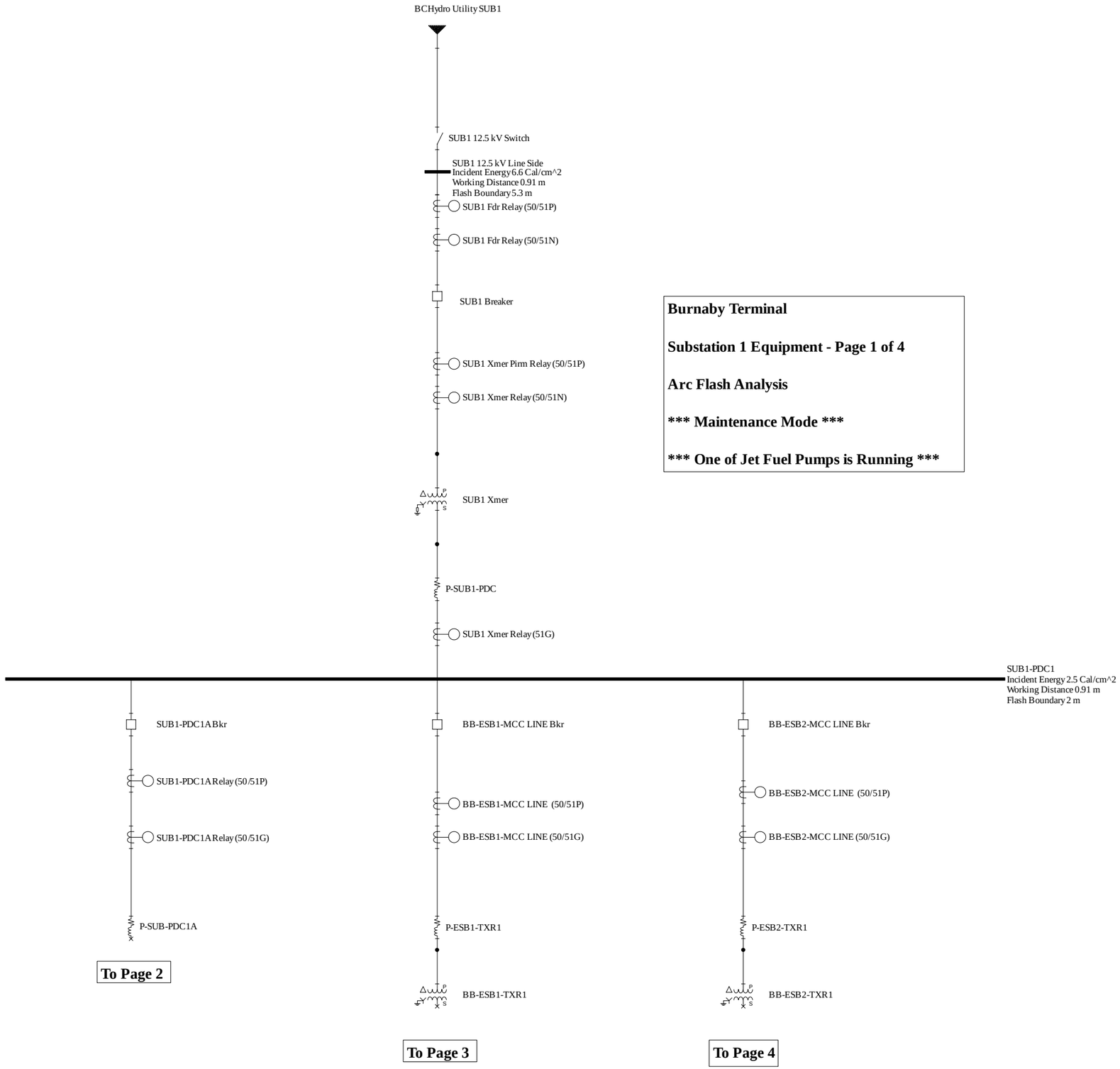
Burnaby Terminal

Substation 2 Equipment - Page 6 of 6

Arc Flash Analysis

***** Maintenance Mode *****





Burnaby Terminal

Substation 1 Equipment - Page 1 of 4

Arc Flash Analysis

***** Maintenance Mode *****

***** One of Jet Fuel Pumps is Running *****

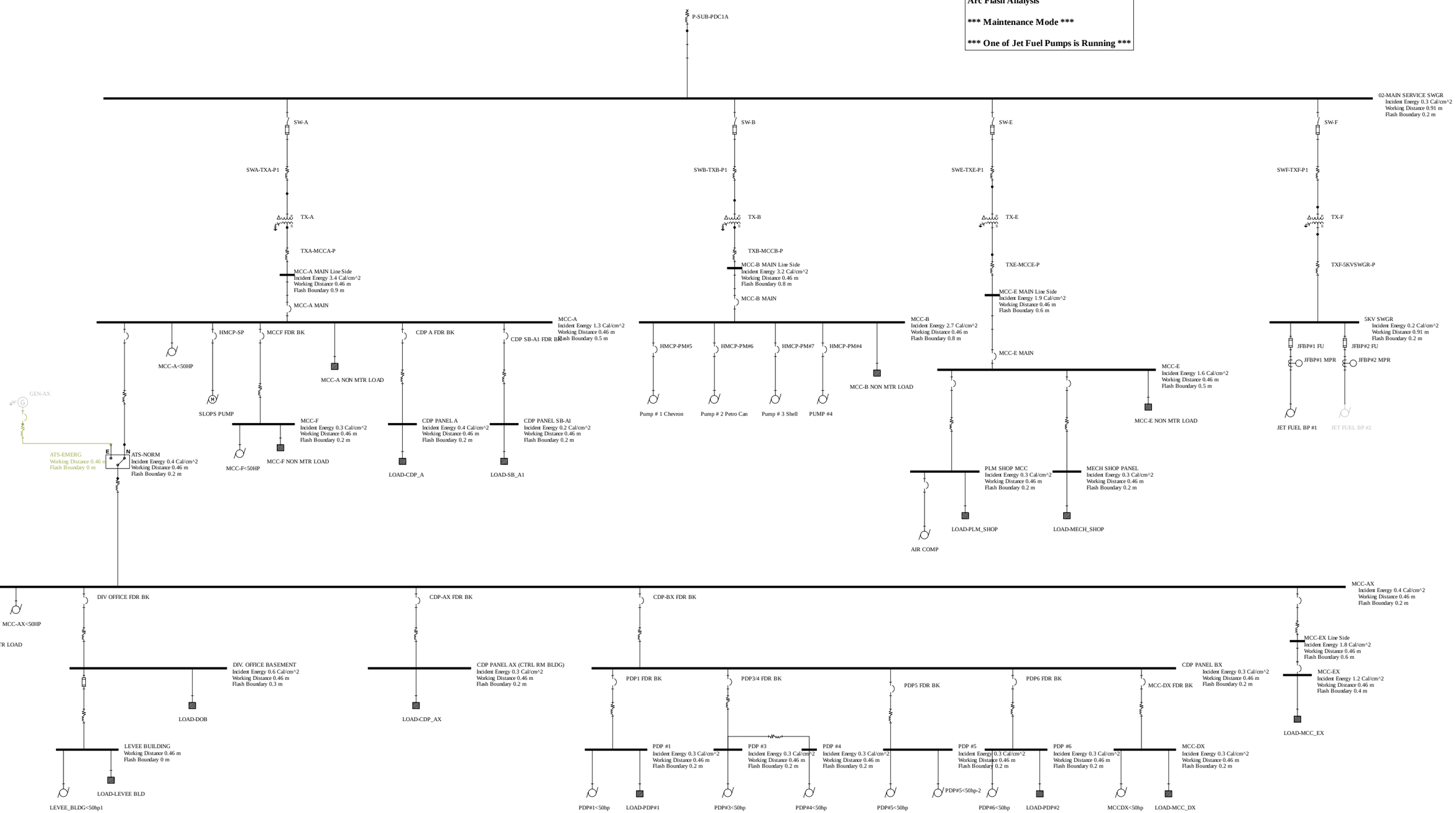
Burnaby Terminal

Substation 1 Equipment - Page 2 of 4

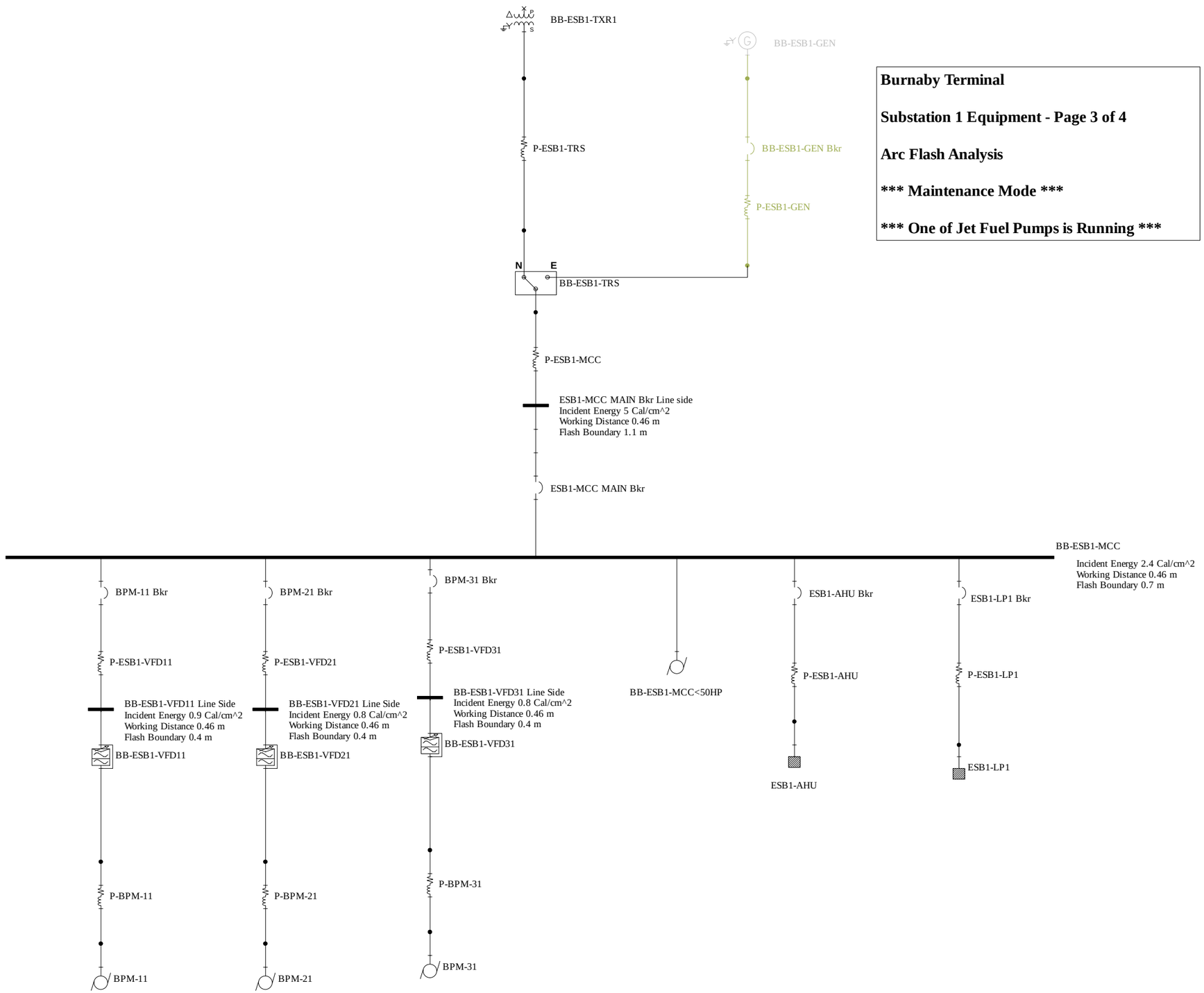
Arc Flash Analysis

***** Maintenance Mode *****

***** One of Jet Fuel Pumps is Running *****



From Page 1



Burnaby Terminal

Substation 1 Equipment - Page 3 of 4

Arc Flash Analysis

***** Maintenance Mode *****

***** One of Jet Fuel Pumps is Running *****

From Page 1

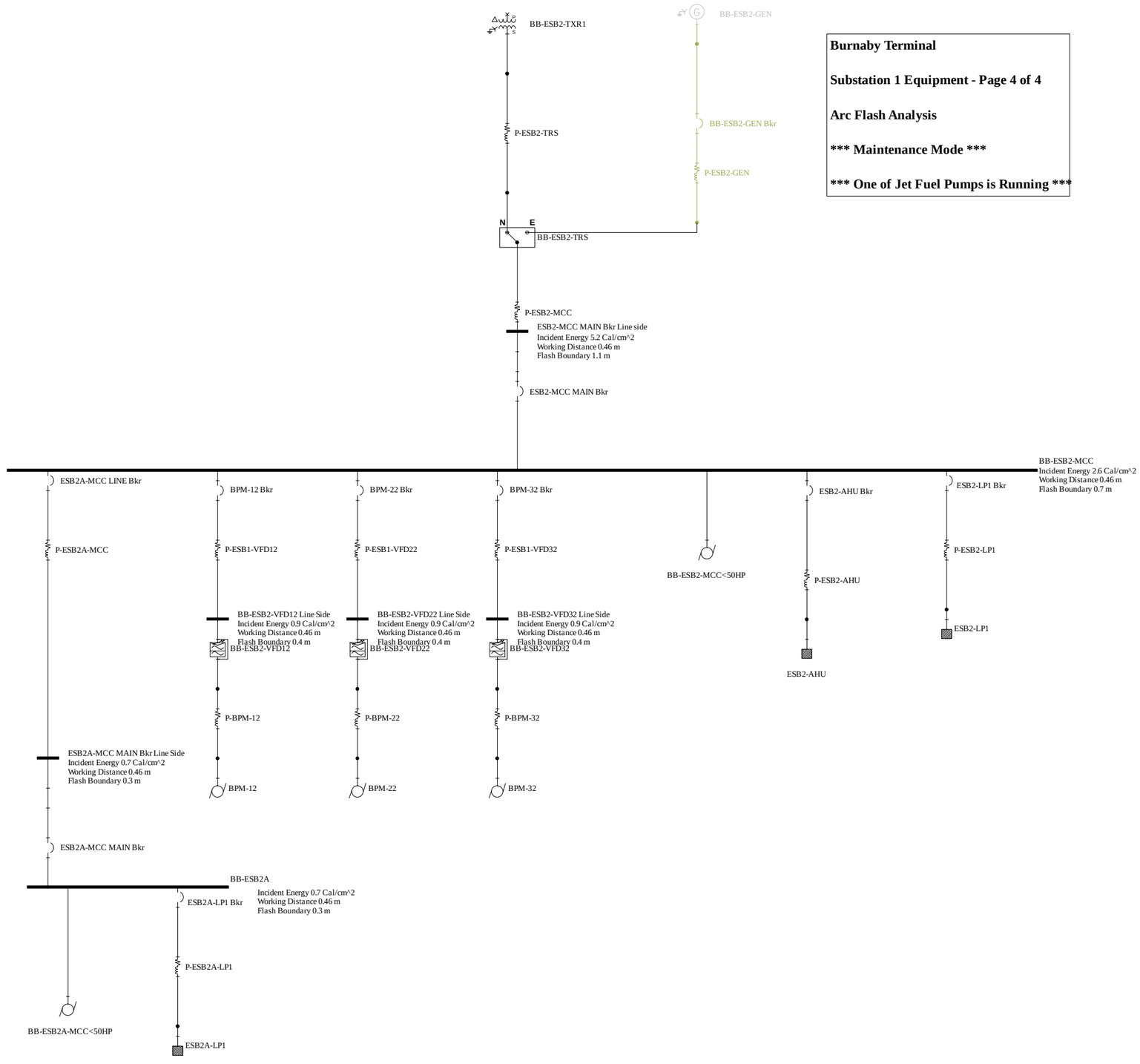
Burnaby Terminal

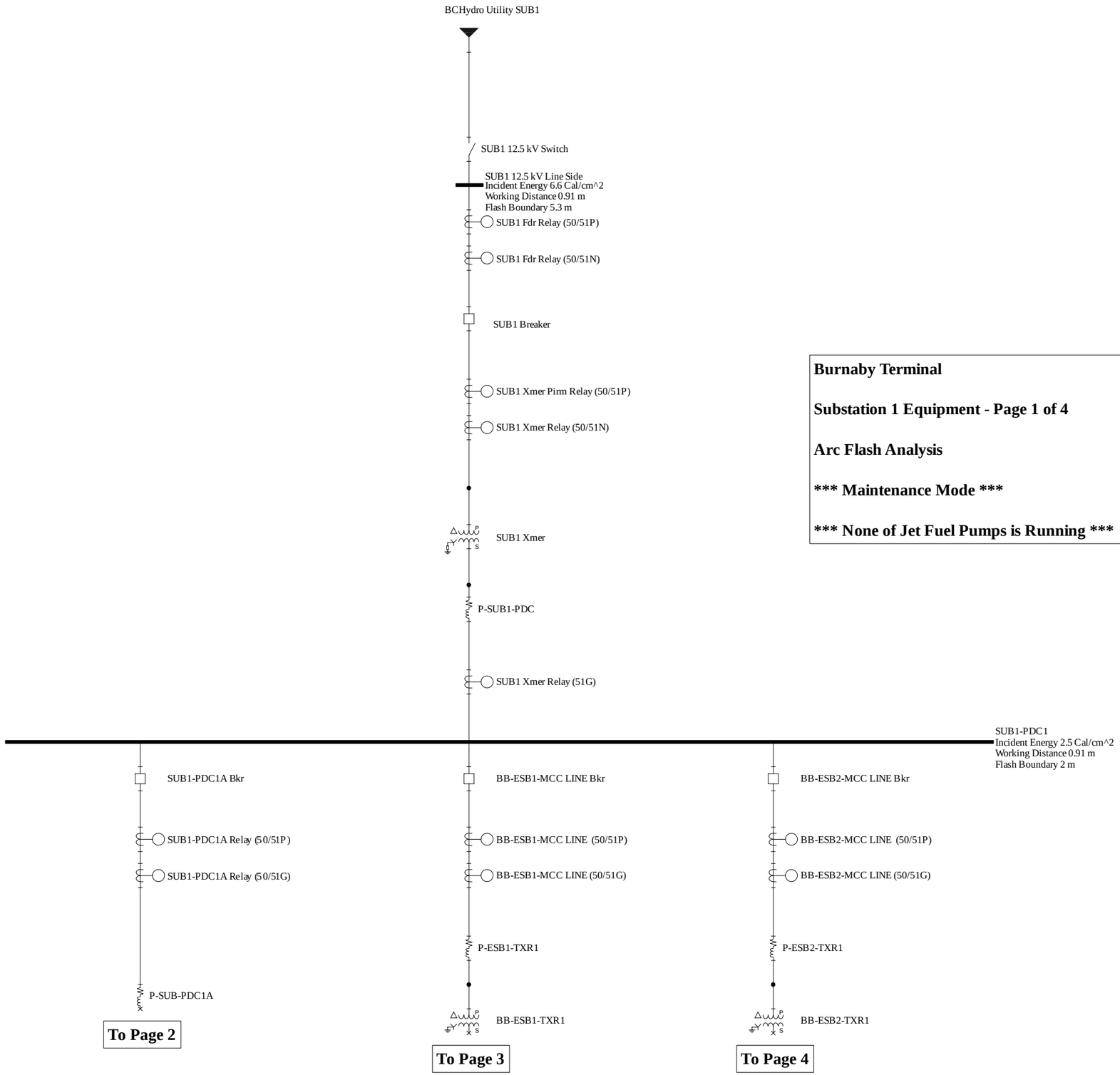
Substation 1 Equipment - Page 4 of 4

Arc Flash Analysis

***** Maintenance Mode *****

***** One of Jet Fuel Pumps is Running *****





Burnaby Terminal

Substation 1 Equipment - Page 1 of 4

Arc Flash Analysis

***** Maintenance Mode *****

***** None of Jet Fuel Pumps is Running *****

From Page 1

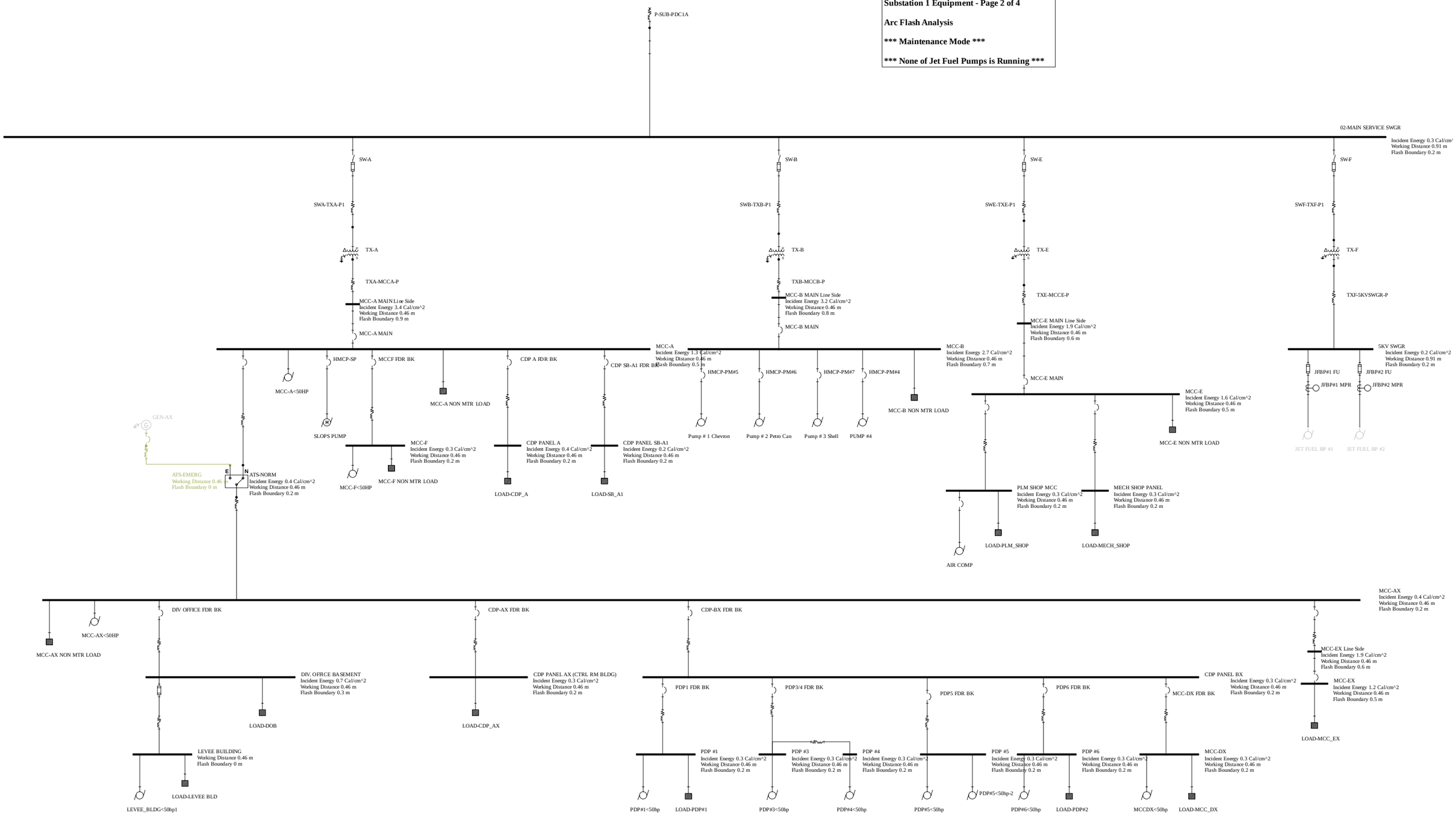
Burnaby Terminal

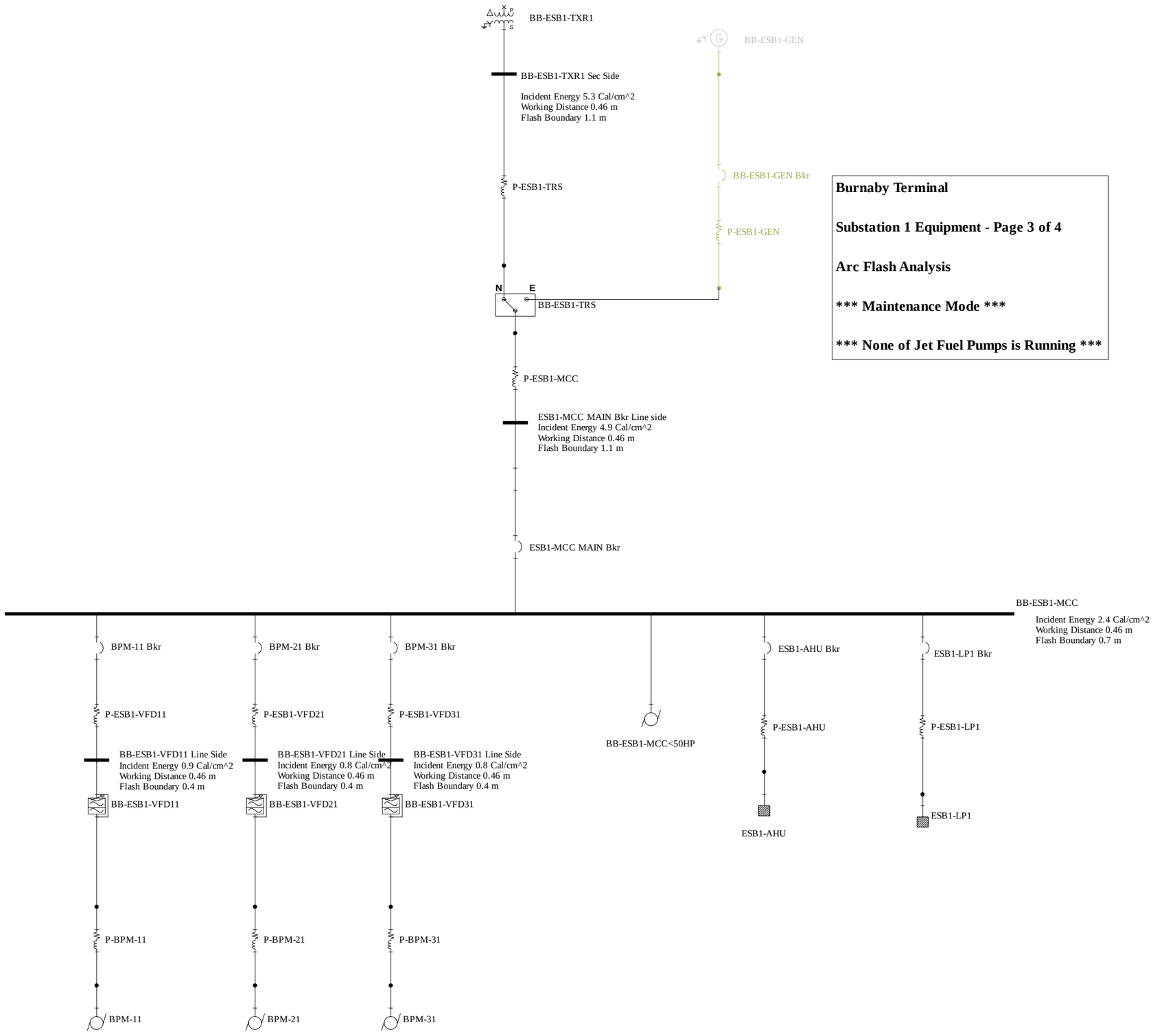
Substation 1 Equipment - Page 2 of 4

Arc Flash Analysis

***** Maintenance Mode *****

***** None of Jet Fuel Pumps is Running *****





Burnaby Terminal

Substation 1 Equipment - Page 3 of 4

Arc Flash Analysis

***** Maintenance Mode *****

***** None of Jet Fuel Pumps is Running *****

From Page 1

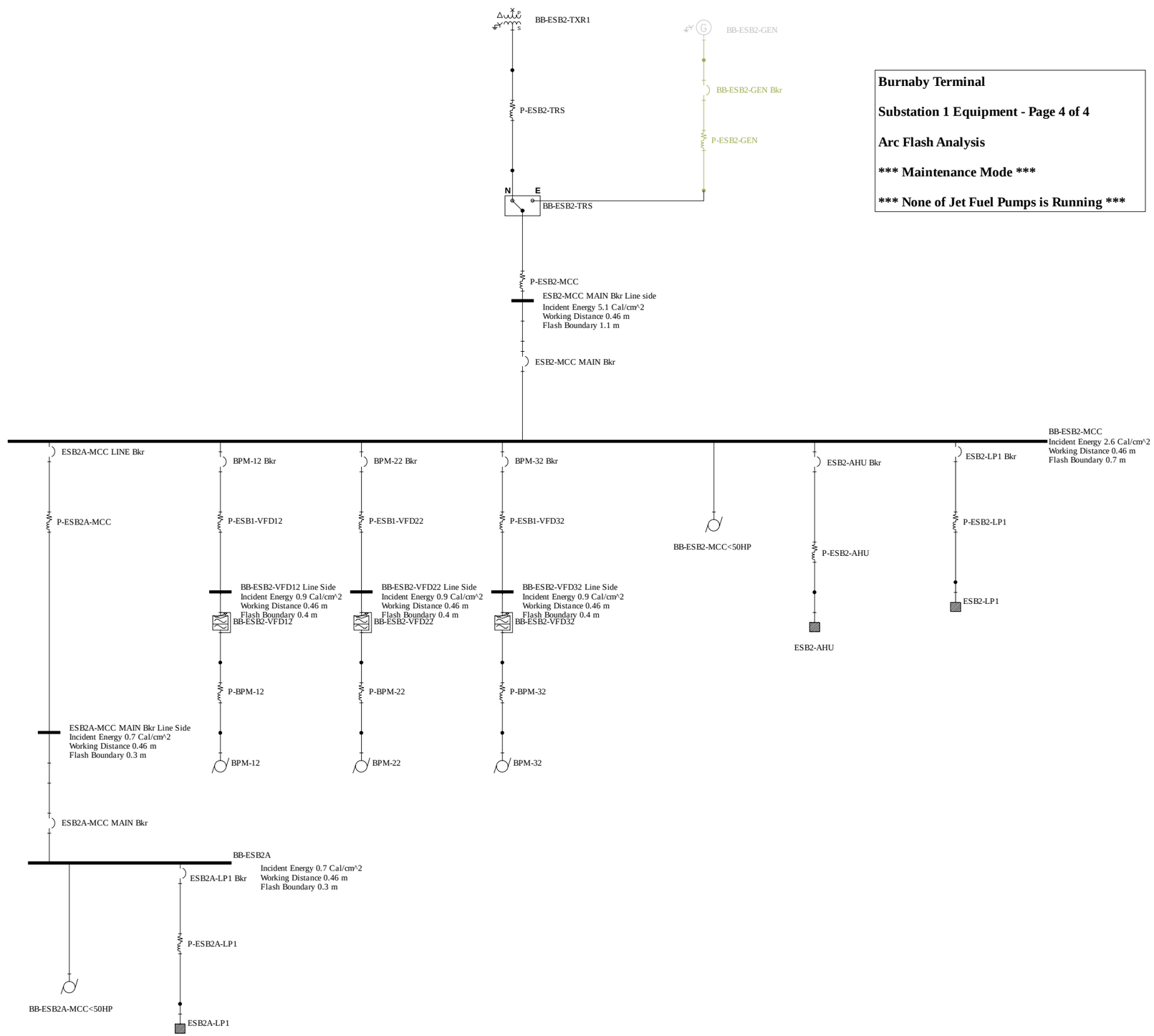
Burnaby Terminal

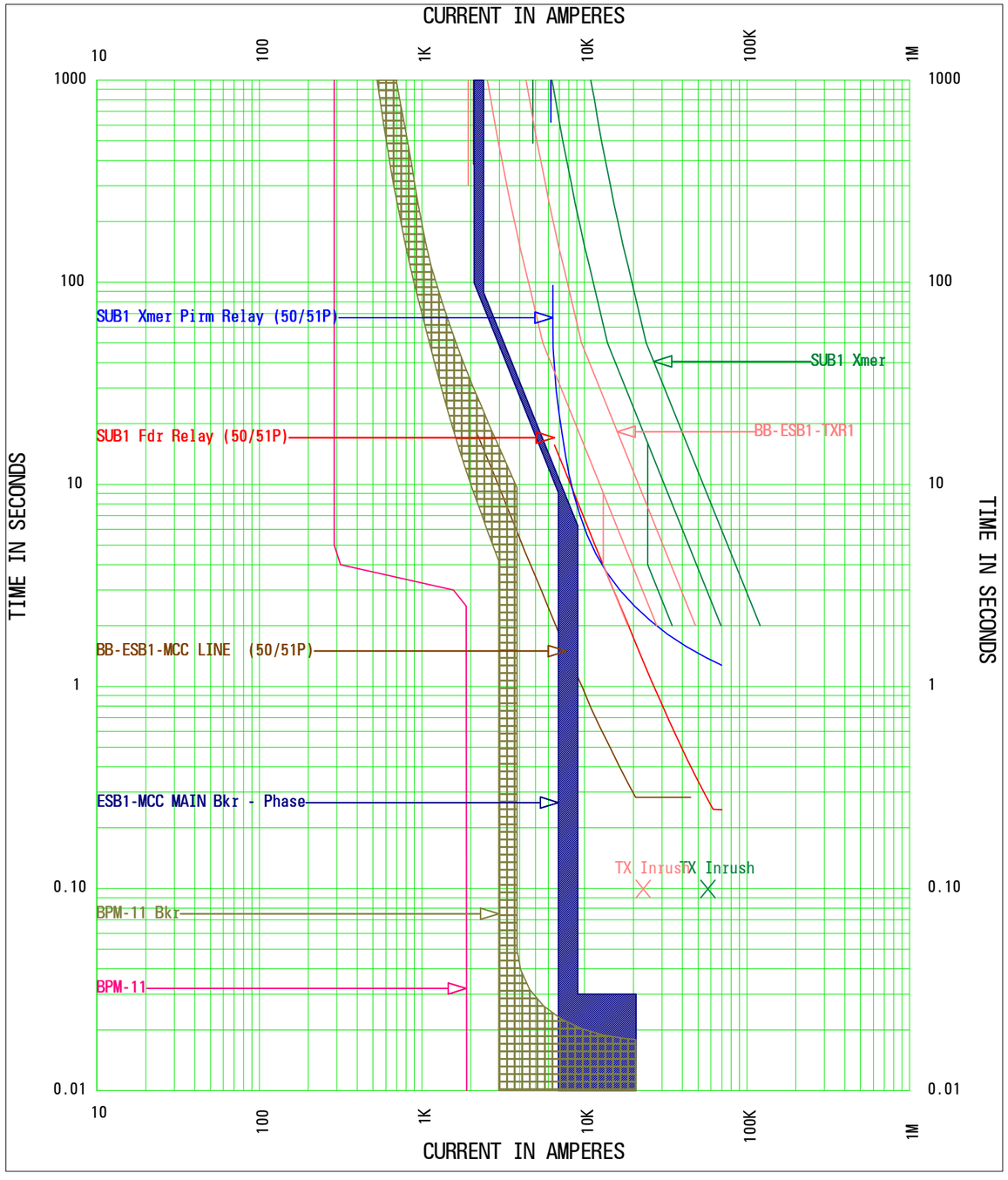
Substation 1 Equipment - Page 4 of 4

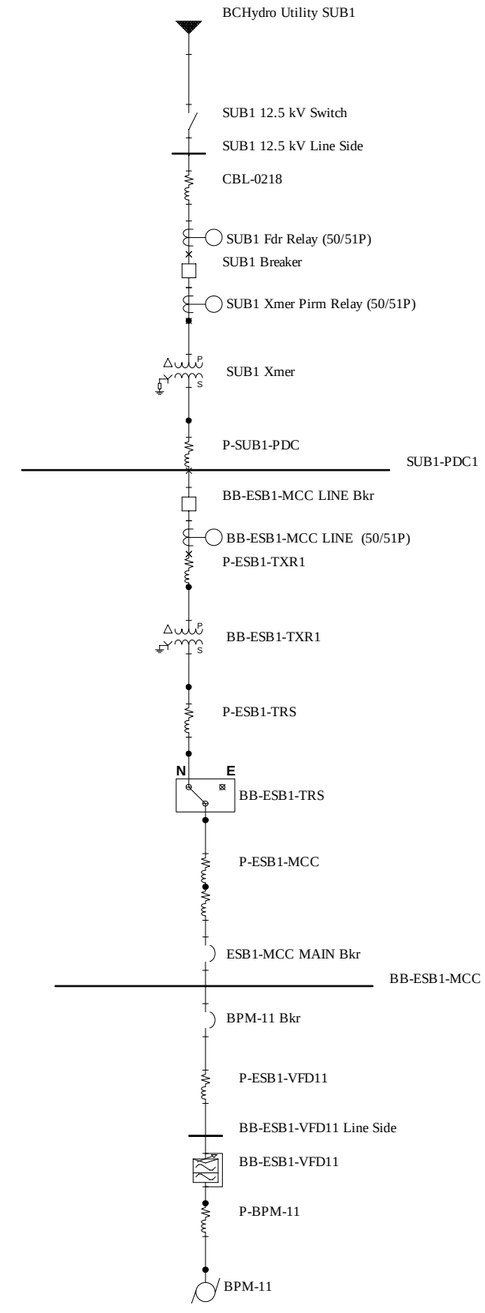
Arc Flash Analysis

***** Maintenance Mode *****

***** None of Jet Fuel Pumps is Running *****







Branch #1-BB-ESB1-MCC IN-SVC TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


-------------------------------------------------------------------------------------------
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-------------------------------------------------------------------------------------------
Device Name:     BB-ESB1-TXR1                              TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB1-TXR1 Prim Side                    Bus Voltage:      12470.0V / 600V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/600 LL
Nominal kVA:     2000.0kVA                                 Pri Connection:   Delta
Full Load kVA:   2000.0kVA                                 Sec Connection:   Wye-Ground
Impedance (%Z):  6.0000                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                       Class Desc:       GE-850
AIC Rating:      N/A                                       Fault Duty:       3362.2A
Current Rating:  300A / 5A                                 Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Setting: 1) 51P                   1 (300A)                 Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse    0.61                                  @5.0X, 0.762s
                                                                        @10.0X, 0.246s

-------------------------------------------------------------------------------------------
```
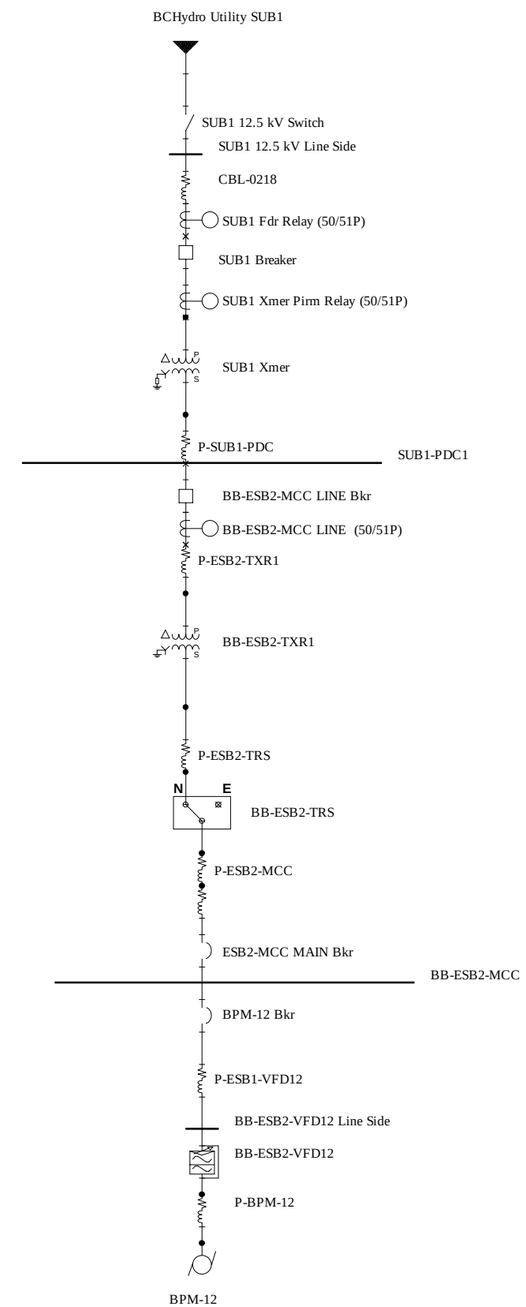

```
Device Name:     SUB1 Xmer                                  TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                        Bus Voltage:      12470.0V / 12470V
                                                            Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve         Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                                  Pri Connection:   Delta
Full Load kVA:   5000.0kVA                                  Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                     Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)              TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                        Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                        Class Desc:       845
AIC Rating:      N/A                                        Fault Duty:       3362.2A
Current Rating:  300A / 5A                                  Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Setting: 1) Phase TOC1            1 (300A)                  Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv          1.1                                    @5.0X, 1.857s
                                                                         @10.0X, 1.327s

-------------------------------------------------------------------------------------------
Device Name:     BB-ESB1-MCC LINE  (50/51P)                 TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                                  Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                        Class Desc:       GE-850
AIC Rating:      N/A                                        Fault Duty:       2168.6A
Current Rating:  100A / 5A                                  Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Setting: 1) 51P                   1 (100A)                  Test Points: @2.0X, 5.020s
         2) IEEE, Ext. Inverse    0.7                                    @5.0X, 0.875s
                                                                         @10.0X, 0.283s

-------------------------------------------------------------------------------------------
Device Name:     BPM-11 Bkr                                 TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB1-MCC                                Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     300-600A
Type:            HLD
AIC Rating:      35kA                                       Fault Duty:       20727.0A
```

```
Frame:           HLD 600V 600A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Trip:            400A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     8.52 (3408A)

-----------------------------------------------------------------------------------------
Device Name:     ESB1-MCC MAIN Bkr                          TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB1-MCC                                Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    MERLIN GERIN
Description:     LSI, 2000A Sensor
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:65                          Fault Duty:       20727.0A
Frame:           MC20H1 600V 2000A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Sensor:          2000A
Plug:            2000A
Setting: 1) LTPU (lo x lr x S)     1; 1 (2000A)
         2) LTD (15-480 Sec.)      60
         3) STPU (1.5-10 x LTPU)   10 (20000A)
         4) STD (INST-0.4)         0.1         I^2 t Out
         5) INST (2-20 x S)        4 (8000A)

-----------------------------------------------------------------------------------------
Device Name:     BPM-11                                     TCC Name:         Branch #1-BB-ESB1-MCC IN-SVC TCC.tcc
Bus Name:        BUS-0043                                   Bus Voltage:      600.0V
                                                            Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Description:     Motor Starting Curve                       Inrush:           6.5 (1881.4A)
Rated Size:      300HP     (1 of 1 Plotted)                 FLA+Load Adder:   289.5A + 0.0A
Power Factor:    0.8                                        Starting Time:    5.00s
Efficiency:      0.93                                       Full Voltage (Square Transient)
```



Branch #2-BB-ESB2-MCC IN-SVC TCC
Current Scale: x 10
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^1
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


-------------------------------------------------------------------------------------------
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-------------------------------------------------------------------------------------------
Device Name:     BB-ESB2-TXR1                                TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB2-TXR1 Prim Side                      Bus Voltage:      12470.0V / 600V
                                                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve          Rated Volts:      12470 LL/600 LL
Nominal kVA:     2000.0kVA                                   Pri Connection:   Delta
Full Load kVA:   2000.0kVA                                   Sec Connection:   Wye-Ground
Impedance (%Z):  6.0000                                      Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Breaker                                TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                         Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE
Description:     600-3000A
Type:            PVDB1
AIC Rating:      16kA                                        Fault Duty:       3362.2A
Frame:           PVDB1-15.5-16000 (3 Cycle) 15500V 800A      Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0

-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                     TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                         Bus Voltage:      12470.0V
Function Name:   Phase
```
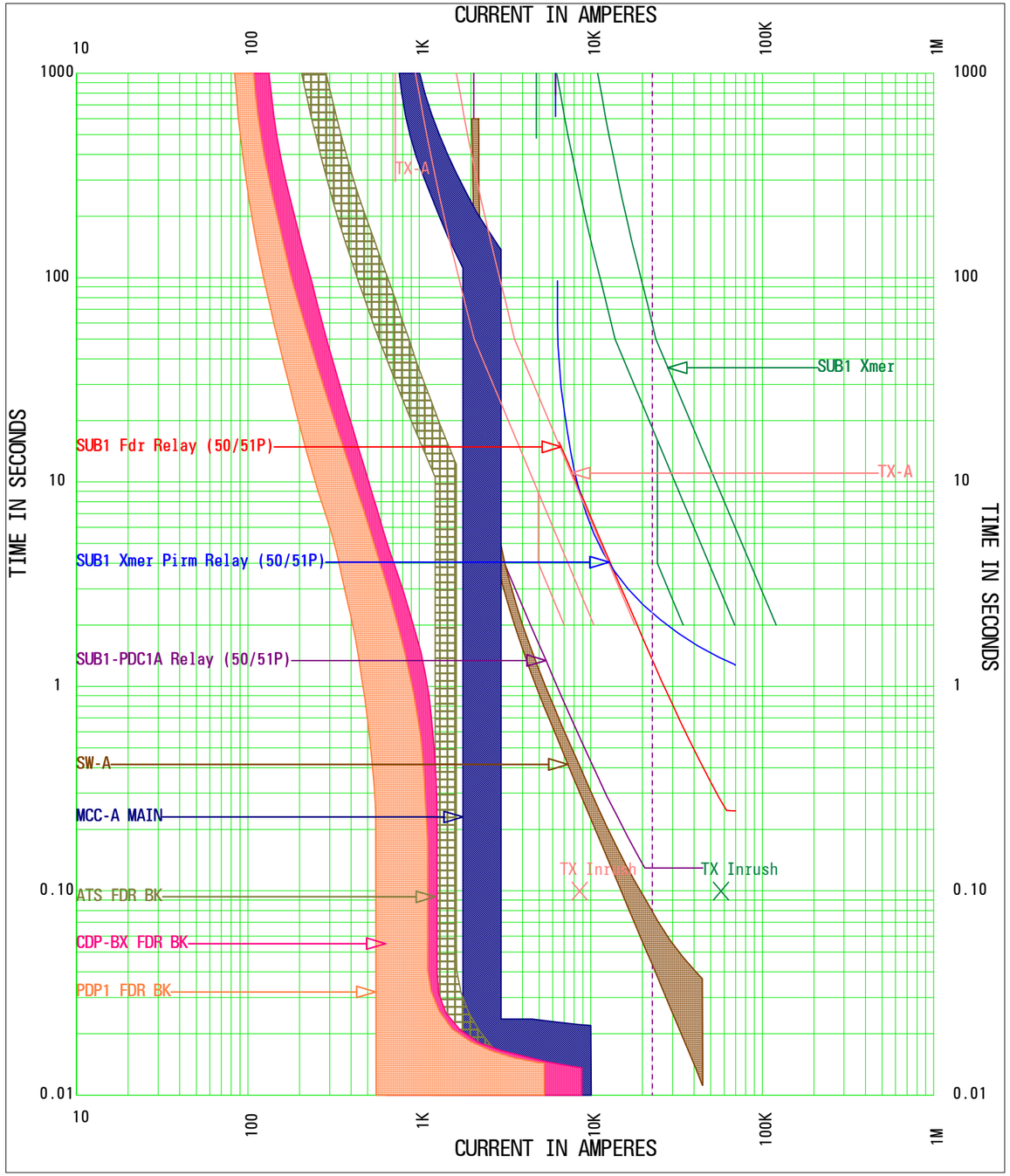
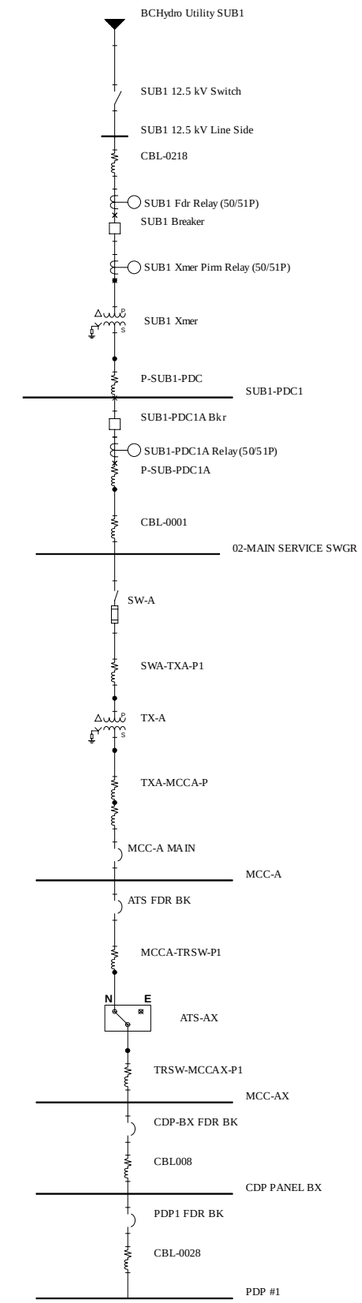

```
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-----------------------------------------------------------------------------------------
Device Name:     BB-ESB2-MCC LINE  (50/51P)             TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2168.6A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (100A)               Test Points: @2.0X, 5.020s
```

```
        2) IEEE, Ext. Inverse     0.7                                @5.0X, 0.875s
        3) 50P                    30 (3000A)                         @10.0X, 0.283s

-----------------------------------------------------------------------------------------
Device Name:     BB-ESB2-MCC LINE Bkr                      TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                                 Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    TOSHIBA
Description:     600-3000A
Type:            VK
AIC Rating:      28kA                                      Fault Duty:       2168.6A
Frame:           VK-10M40A 15000V 1200A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0

-----------------------------------------------------------------------------------------
Device Name:     BPM-12 Bkr                                TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB2-MCC                               Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     300-600A
Type:            HLD
AIC Rating:      35kA                                      Fault Duty:       21702.7A
Frame:           HLD 600V 600A                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            400A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     7.47 (2988A)

-----------------------------------------------------------------------------------------
Device Name:     ESB2-MCC MAIN Bkr                         TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB2-MCC                               Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    MERLIN GERIN
Description:     LSI, 2000A Sensor
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:65                         Fault Duty:       21702.7A
Frame:           MC20H1 600V 2000A                         Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Sensor:          2000A
Plug:            2000A
Setting: 1) LTPU (lo x lr x S)     1; 1 (2000A)
         2) LTD (15-480 Sec.)      60
         3) STPU (1.5-10 x LTPU)   10 (20000A)
         4) STD (INST-0.4)         0.1         I^2 t Out
```

```
         5) INST (2-20 x S)        4 (8000A)

-----------------------------------------------------------------------------------------
Device Name:     BPM-12                                    TCC Name:         Branch #2-BB-ESB2-MCC IN-SVC TCC.tcc
Bus Name:        BUS-0059                                  Bus Voltage:      600.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           6.5 (1881.4A)
Rated Size:      300HP     (1 of 1 Plotted)                FLA+Load Adder:   289.5A + 0.0A
Power Factor:    0.8                                       Starting Time:    5.00s
Efficiency:      0.93                                      Full Voltage (Square Transient)
```





Branch #3-MCC-AX IN-SVC TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #3-MCC-AX IN-SVC TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


-------------------------------------------------------------------------------------------
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-------------------------------------------------------------------------------------------
Device Name:     SW-A                                      TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        02-MAIN SERVICE SWGR                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    S&C
Description:     5E-200E Standard Speed
Type:            SMU-20, 14.4kV E-Rated
AIC Rating:      14kA                                      Fault Duty:       2163.9A
Cartridge:       SMU-20, 50E 12470V 50A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            50A

-------------------------------------------------------------------------------------------
Device Name:     TX-A                                      TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        BUS-0005                                  Bus Voltage:      12470.0V / 480V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/480 LL
Nominal kVA:     750.0kVA                                  Pri Connection:   Delta
Full Load kVA:   750.0kVA                                  Sec Connection:   Wye-Ground
Impedance (%Z):  5.9400                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
```
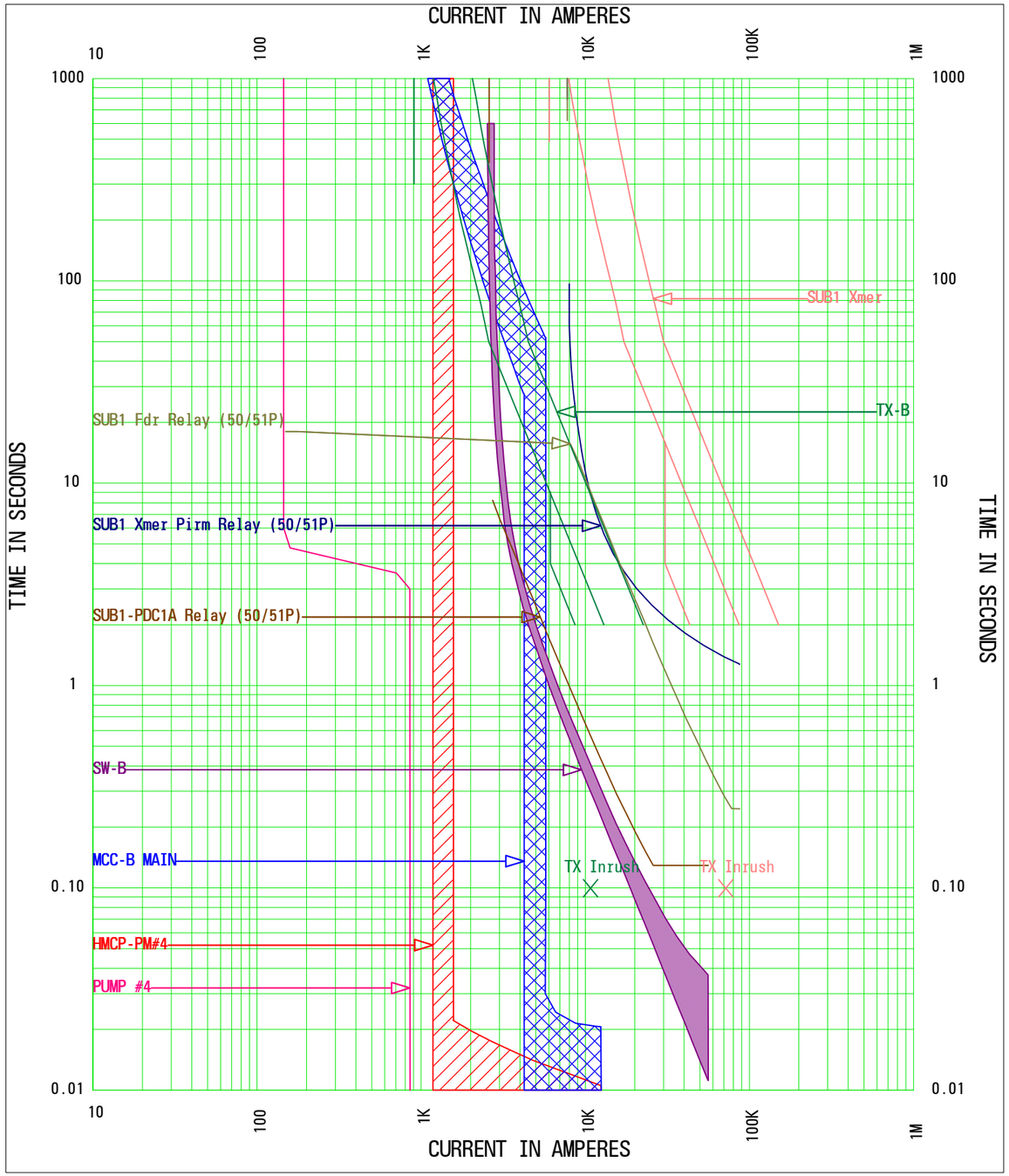
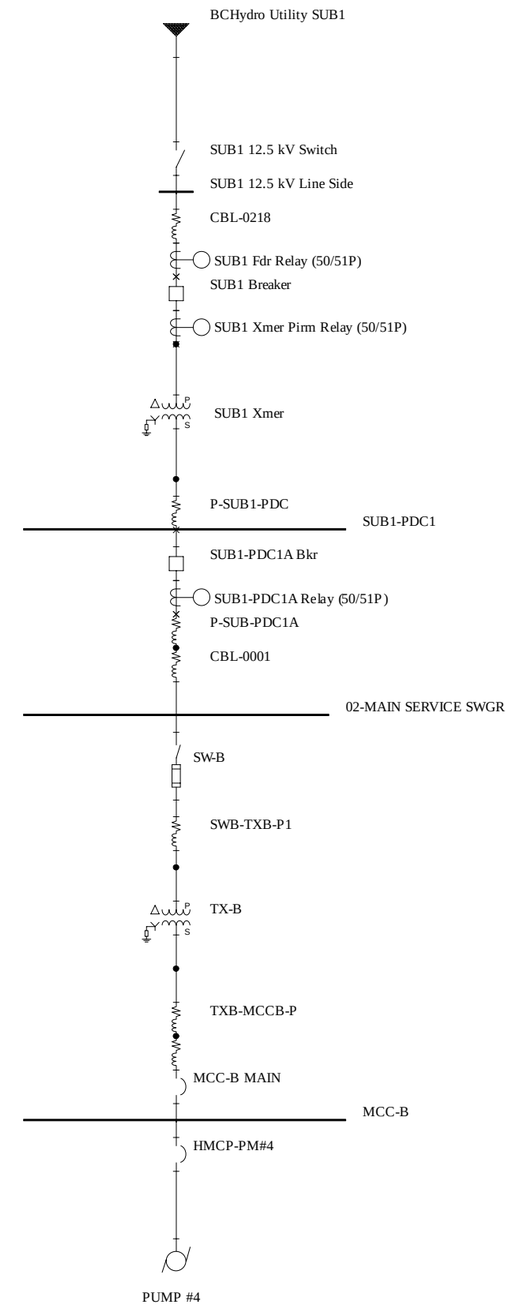

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2168.6A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
                                                                        @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     PDP1 FDR BK                               TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        CDP PANEL BX                              Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FD
AIC Rating:      25kA                                      Fault Duty:       6712.4A
Frame:           FD 480V 100A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            100A
Setting: 1) Fixed

-----------------------------------------------------------------------------------------
Device Name:     ATS FDR BK                                TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        MCC-A                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    WESTINGHOUSE
Description:     100-400A
Type:            KDB, KD
AIC Rating:      35kA                                      Fault Duty:       12575.5A
Frame:           KD 480V 225A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            225A
Setting: 1) LTD
         2) INST                   8 (1800A)

-----------------------------------------------------------------------------------------
Device Name:     MCC-A MAIN                                TCC Name:         Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:        MCC-A                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     700-1200A
Type:            NB
AIC Rating:      30kA                                      Fault Duty:       12575.5A
Frame:           NB 480V 800A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            700A
Setting: 1) Thermal Curve (Fixed
         2) INST (3000-6000A)      3000 (3000A)
```

Device Name:	CDP-BX FDR BK	TCC Name:	Branch #3-MCC-AX IN-SVC TCC.tcc
Bus Name:	MCC-AX	Bus Voltage:	480.0V
Function Name:	Phase		
Manufacturer:	CUTLER-HAMMER		
Description:	15-225A		
Type:	HFD		
AIC Rating:	65kA	Fault Duty:	11085.0A
Frame:	HFD 480V 125A	Tcc Current Multiplier:	1
Tcc Time Multiplier:	1	Tcc Time Adder:	0
Trip:	125A		
Setting:	1) Fixed		





Branch #4-MCC-B IN-SVC TCC
Current Scale: x 1
Reference Voltage: 480

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #4-MCC-B IN-SVC TCC.tcc
Reference Voltage: 480 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     SW-B                                      TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        02-MAIN SERVICE SWGR                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    S&C
Description:     5E-200E Standard Speed
Type:            SMU-20, 14.4kV E-Rated
AIC Rating:      14kA                                      Fault Duty:       2163.9A
Cartridge:       SMU-20, 50E 12470V 50A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            50A

-------------------------------------------------------------------------------------------
Device Name:     TX-B                                      TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        BUS-0006                                  Bus Voltage:      12470.0V / 480V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/480 LL
Nominal kVA:     750.0kVA                                  Pri Connection:   Delta
Full Load kVA:   750.0kVA                                  Sec Connection:   Wye-Ground
Impedance (%Z):  6.0200                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
```
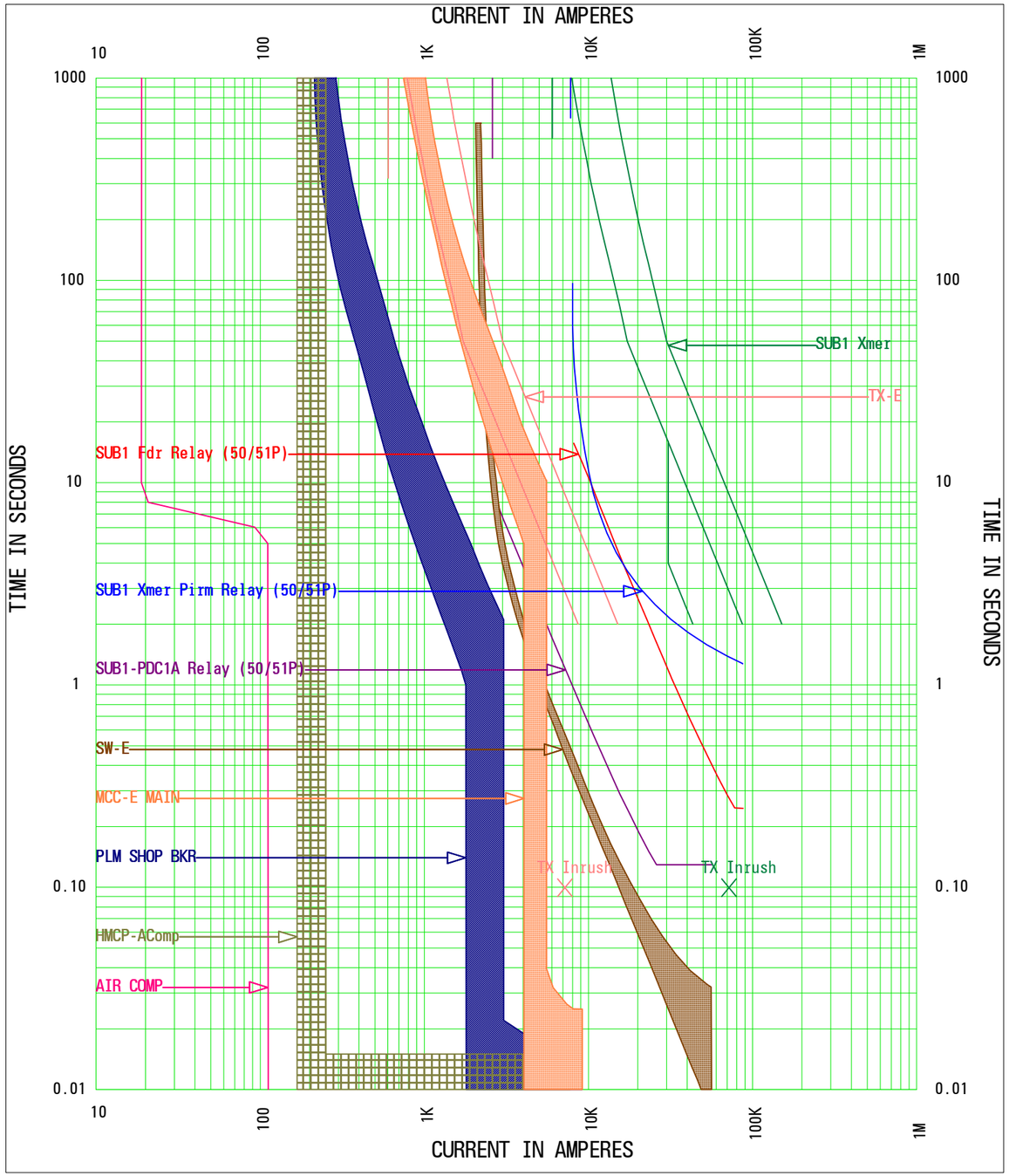
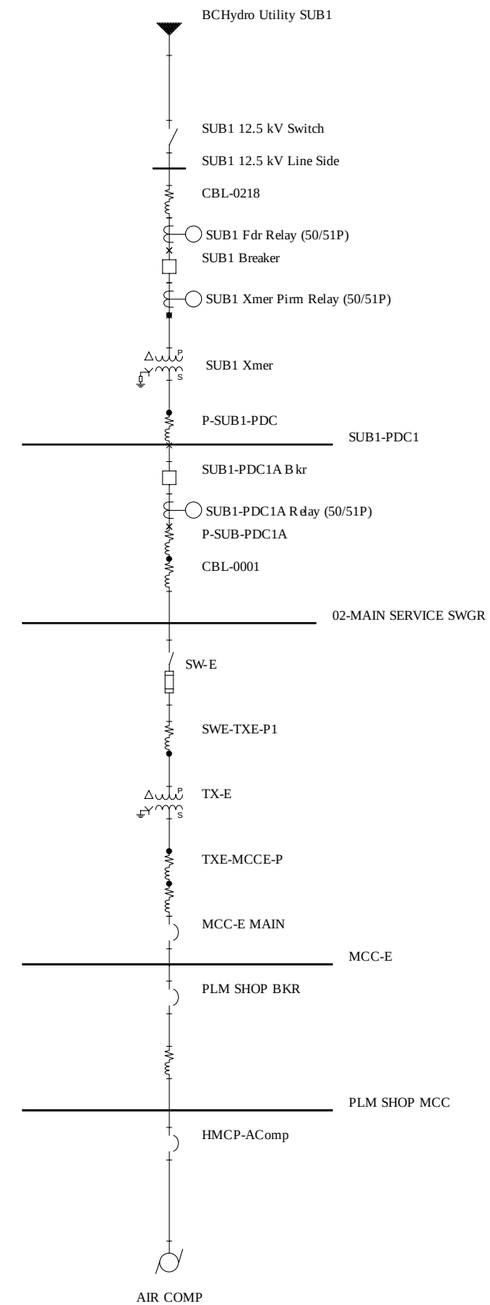

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2168.6A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
                                                                        @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     HMCP-PM#4                                 TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        MCC-B                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     250A (1000-2000A Inst)
Type:            HMCP
AIC Rating:      65kA                                      Fault Duty:       12489.9A
Frame:           HMCP 480V 250A                            Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Setting: 1) INST (1000-2000A)      D (1375A)

-----------------------------------------------------------------------------------------
Device Name:     MCC-B MAIN                                TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        MCC-B                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     125-800A
Type:            MA
AIC Rating:      30kA                                      Fault Duty:       12489.9A
Frame:           MA 480V 800A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            800A
Setting: 1) Thermal Curve (Fixed
         2) INST (3000-6000A)      5000 (5000A)

-----------------------------------------------------------------------------------------
Device Name:     PUMP #4                                   TCC Name:         Branch #4-MCC-B IN-SVC TCC.tcc
Bus Name:        MCC-B                                     Bus Voltage:      480.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           5.9 (855.5A)
Rated Size:      125HP     (1 of 1 Plotted)                FLA+Load Adder:   145.0A + 0.0A
Power Factor:    0.832                                     Starting Time:    6.00s
Efficiency:      0.93                                      Full Voltage (Square Transient)
```





Branch #5-MCC-E IN-SVC TCC
Current Scale: x 1
Reference Voltage: 480

Project Name: Burnaby Terminal(AF In Service Mode-1 jet fuel)
TCC Name: Branch #5-MCC-E IN-SVC TCC.tcc
Reference Voltage: 480 V
Current Scale: X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current

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Device Name: SW-E
Bus Name: 02-MAIN SERVICE SWGR
Function Name: Phase
Manufacturer: S&C
Description: 5E-200E Standard Speed
Type: SMU-20, 14.4kV E-Rated
AIC Rating: 14kA
Cartridge: SMU-20, 40E 12470V 40A
Tcc Time Multiplier: 1
Size: 40A

TCC Name: Branch #5-MCC-E IN-SVC TCC.tcc
Bus Voltage: 12470.0V
Fault Duty: 2163.9A
Tcc Current Multiplier: 1
Tcc Time Adder: 0

Device Name: TX-E
Bus Name: BUS-0007
Tcc Time Multiplier: 1
Description: 2-Winding Transformer Damage Curve
Nominal kVA: 500.0kVA
Full Load kVA: 625.0kVA
Impedance (%Z): 4.6000

TCC Name: Branch #5-MCC-E IN-SVC TCC.tcc
Bus Voltage: 12470.0V / 480V
Tcc Current Multiplier: 1
Tcc Time Adder: 0
Rated Volts: 12470 LL/480 LL
Pri Connection: Delta
Sec Connection: Wye-Ground
Inrush Factor: 12.0x

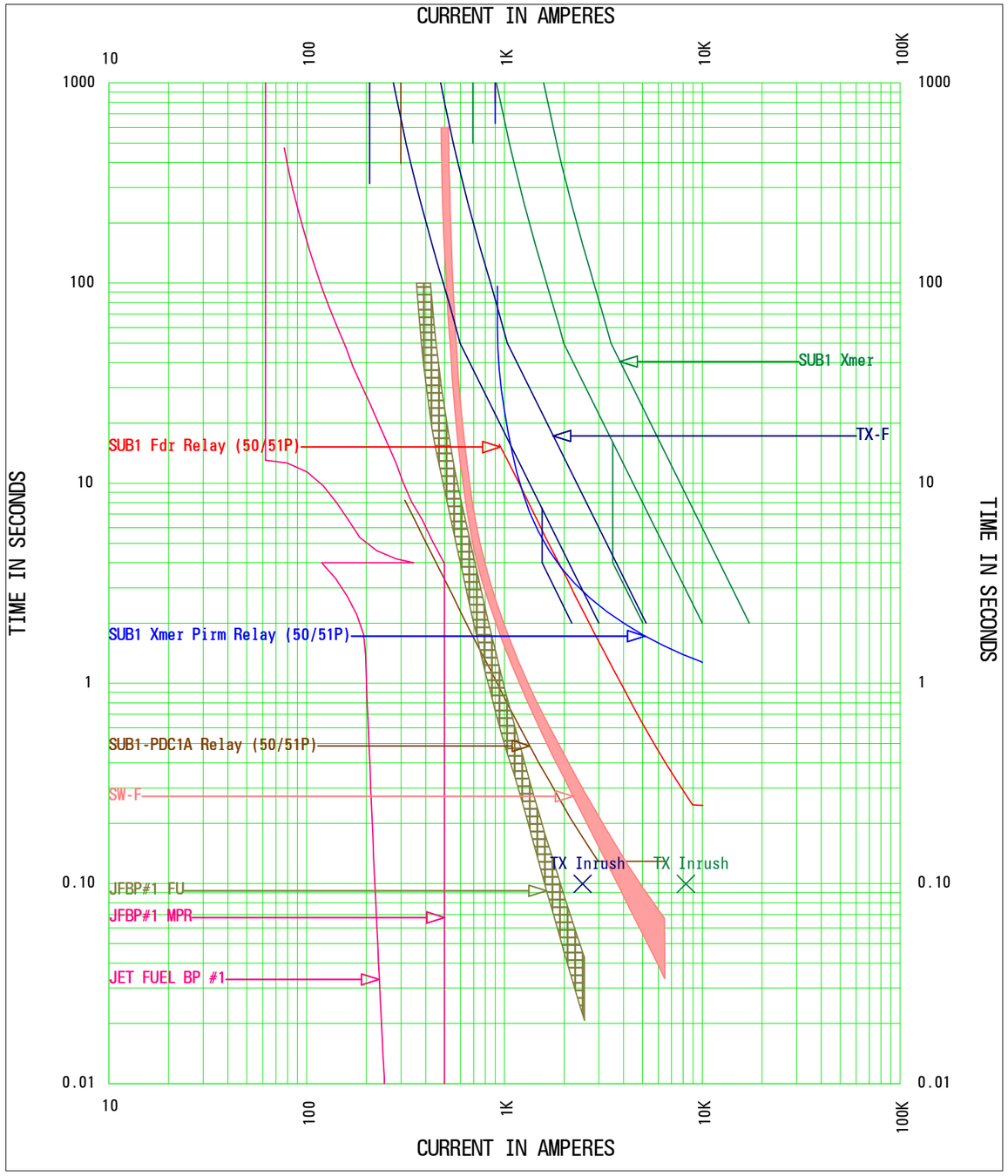
Device Name: SUB1 Fdr Relay (50/51P)
Bus Name: SUB1 Xmer Prim Side

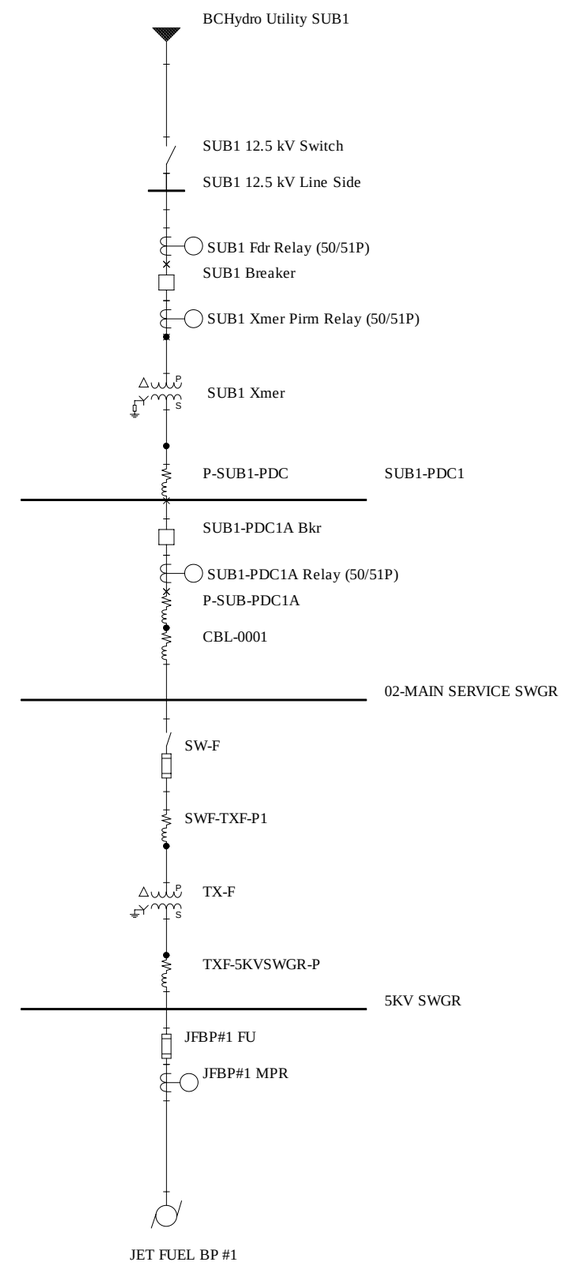
TCC Name: Branch #5-MCC-E IN-SVC TCC.tcc
Bus Voltage: 12470.0V

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-----------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2168.6A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
                                                                        @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     MCC-E MAIN                                TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        MCC-E                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    WESTINGHOUSE
Description:     125-600A
Type:            HLA
AIC Rating:      35kA                                      Fault Duty:       9187.4A
Frame:           HLA 480V 600A                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            600A
Setting: 1) LTD
         2) INST                   8 (4800A)

-----------------------------------------------------------------------------------------
Device Name:     PLM SHOP BKR                              TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        MCC-E                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FDC
AIC Rating:      100kA                                     Fault Duty:       9187.4A
Frame:           FDC 480V 200A                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            200A
Setting: 1) Fixed

-----------------------------------------------------------------------------------------
Device Name:     AIR COMP                                  TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        PLM SHOP MCC                              Bus Voltage:      480.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           5.9 (112.1A)
Rated Size:      15HP      (1 of 1 Plotted)                FLA+Load Adder:   19.0A + 0.0A
Power Factor:    0.85                                      Starting Time:    10.00s
Efficiency:      0.93                                      Full Voltage (Square Transient)
-----------------------------------------------------------------------------------------
Device Name:     HMCP-AComp                                TCC Name:         Branch #5-MCC-E IN-SVC TCC.tcc
Bus Name:        PLM SHOP MCC                              Bus Voltage:      480.0V
Function Name:   Phase
```

```
Manufacturer:    CUTLER-HAMMER
Description:     30A (90-300A Inst)
Type:            HMCP
AIC Rating:      65kA                                    Fault Duty:       7735.7A
Frame:           HMCP 480V 30A                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                   Tcc Time Adder:       0
Setting: 1) INST (90-300A)         E (210A)
```





Branch #6-5kV SWGR IN-SVC TCC
Current Scale: x 1
Reference Voltage: 4160

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #6-5kV SWGR IN-SVC TCC.tcc
Reference Voltage: 4160 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------
Device Name:     SW-F                                    TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        02-MAIN SERVICE SWGR                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    S&C
Description:     5E-200E Standard Speed
Type:            SMU-20, 14.4kV E-Rated
AIC Rating:      14kA                                    Fault Duty:       2163.9A
Cartridge:       SMU-20, 80E 12470V 80A                  Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                   Tcc Time Adder:       0
Size:            80A

-------------------------------------------------------------------------------------
Device Name:     TX-F                                    TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        BUS-0008                                Bus Voltage:      12470.0V / 4160V
                                                         Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                   Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve      Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                               Pri Connection:   Delta
Full Load kVA:   1680.0kVA                               Sec Connection:   Wye-Ground
Impedance (%Z):  5.4800                                  Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                 TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                     Bus Voltage:      12470.0V
```
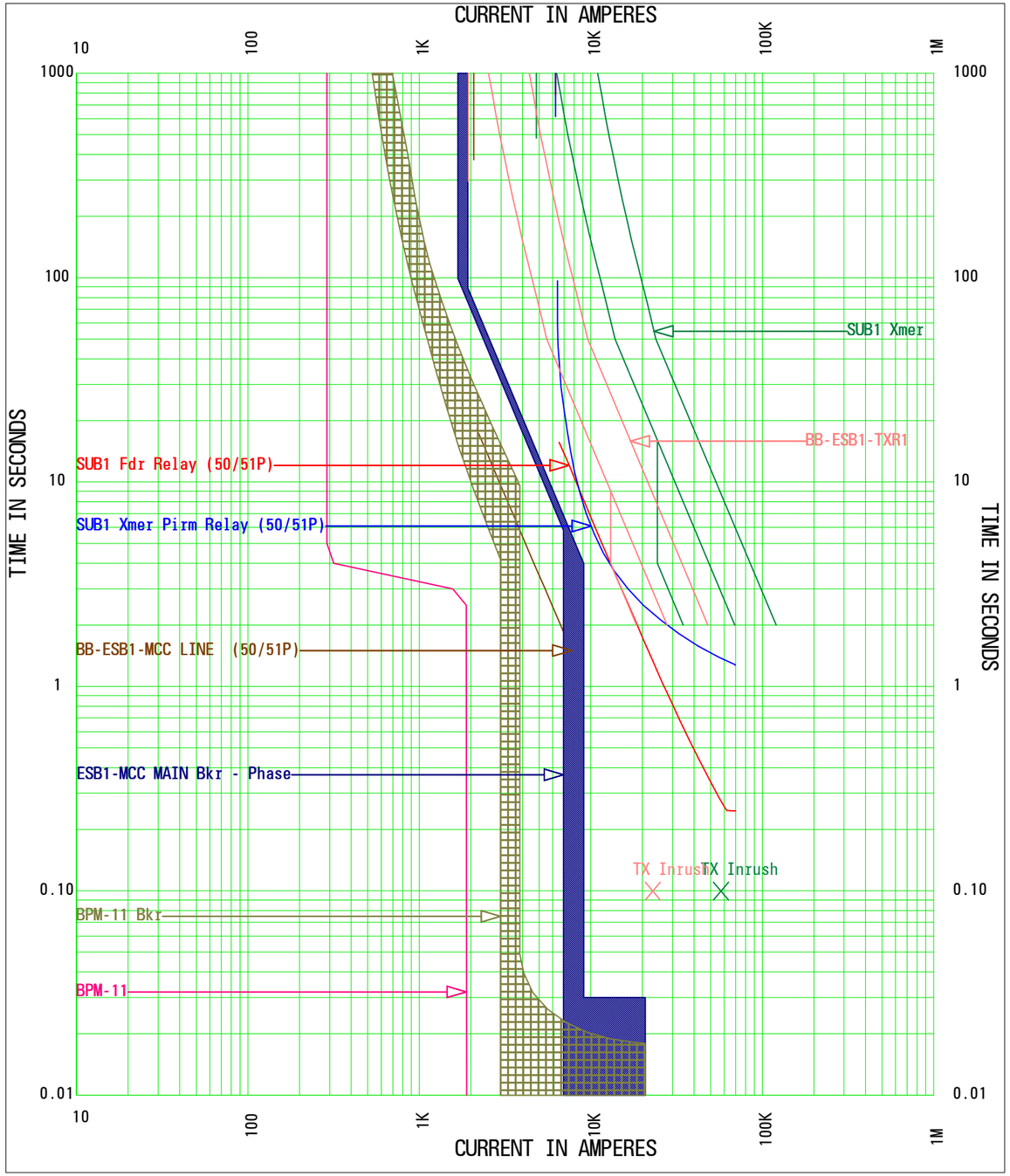
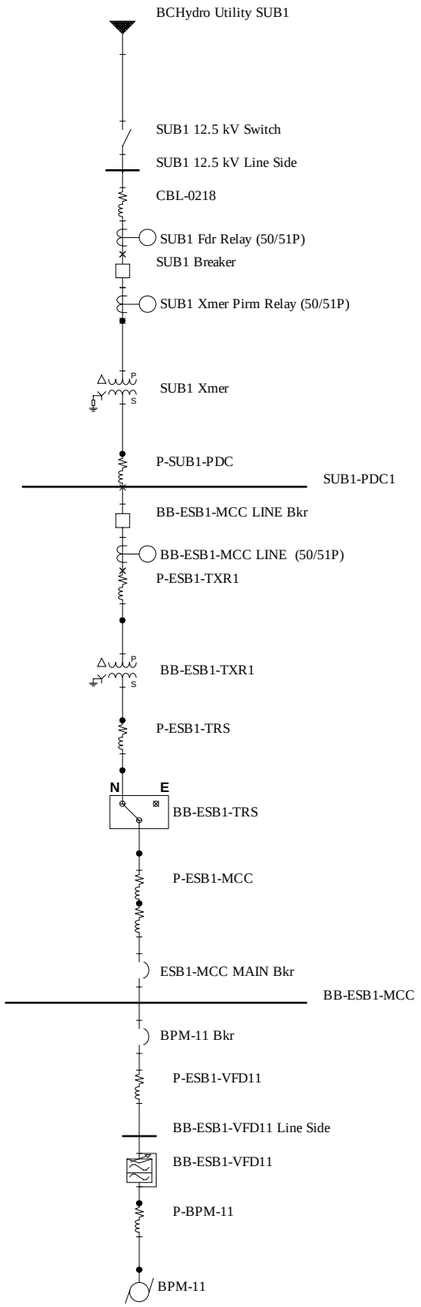

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

--------------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
--------------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3362.2A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

--------------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2168.6A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
                                                                        @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     JET FUEL BP #1                            TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        5KV SWGR                                  Bus Voltage:      4160.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           4.0 (248.0A)
Rated Size:      500HP     (1 of 1 Plotted)                FLA+Load Adder:   62.0A + 0.0A
Power Factor:    0.898                                     Starting Time:    10.00s
Efficiency:      0.93                                      Auto Transformer
-----------------------------------------------------------------------------------------
Device Name:     JFBP#1 FU                                 TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        5KV SWGR                                  Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    BUSSMANN
Description:     30A & 2R-24R
Type:            JCL-B, 5.08kV R-Rated
AIC Rating:      50kA                                      Fault Duty:       2532.9A
Cartridge:       JCL-B-4R 5080V 130A                       Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            130A

-----------------------------------------------------------------------------------------
Device Name:     JFBP#1 MPR                                TCC Name:         Branch #6-5kV SWGR IN-SVC TCC.tcc
Bus Name:        5KV SWGR                                  Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     49/50
Type:            269 Plus                                  Class Desc:       269 Plus
Fault Duty:      2532.9A                                   Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Current Rating:  100A / 5A                                 FLA:              62.00A
Setting: 1) O/L Pickup             1.25 (77.5A)            Test Points: @2.0X, 87.000s
         2) O/L Curves             Curve 3                              @5.0X, 10.000s
         3) S/C Trip               8 (496A)                             @10.0X, 4.000s
```





Branch #7-BB-ESB1-MCC MAINT TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name:          Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     BB-ESB1-TXR1                              TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        BB-ESB1-TXR1 Prim Side                    Bus Voltage:      12470.0V / 600V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/600 LL
Nominal kVA:     2000.0kVA                                 Pri Connection:   Delta
Full Load kVA:   2000.0kVA                                 Sec Connection:   Wye-Ground
Impedance (%Z):  6.0000                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                       Class Desc:       GE-850
AIC Rating:      N/A                                       Fault Duty:       3364.7A
Current Rating:  300A / 5A                                 Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Setting: 1) 51P                   1 (300A)                 Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse    0.61                                  @5.0X, 0.762s
                                                                        @10.0X, 0.246s

-------------------------------------------------------------------------------------------
```
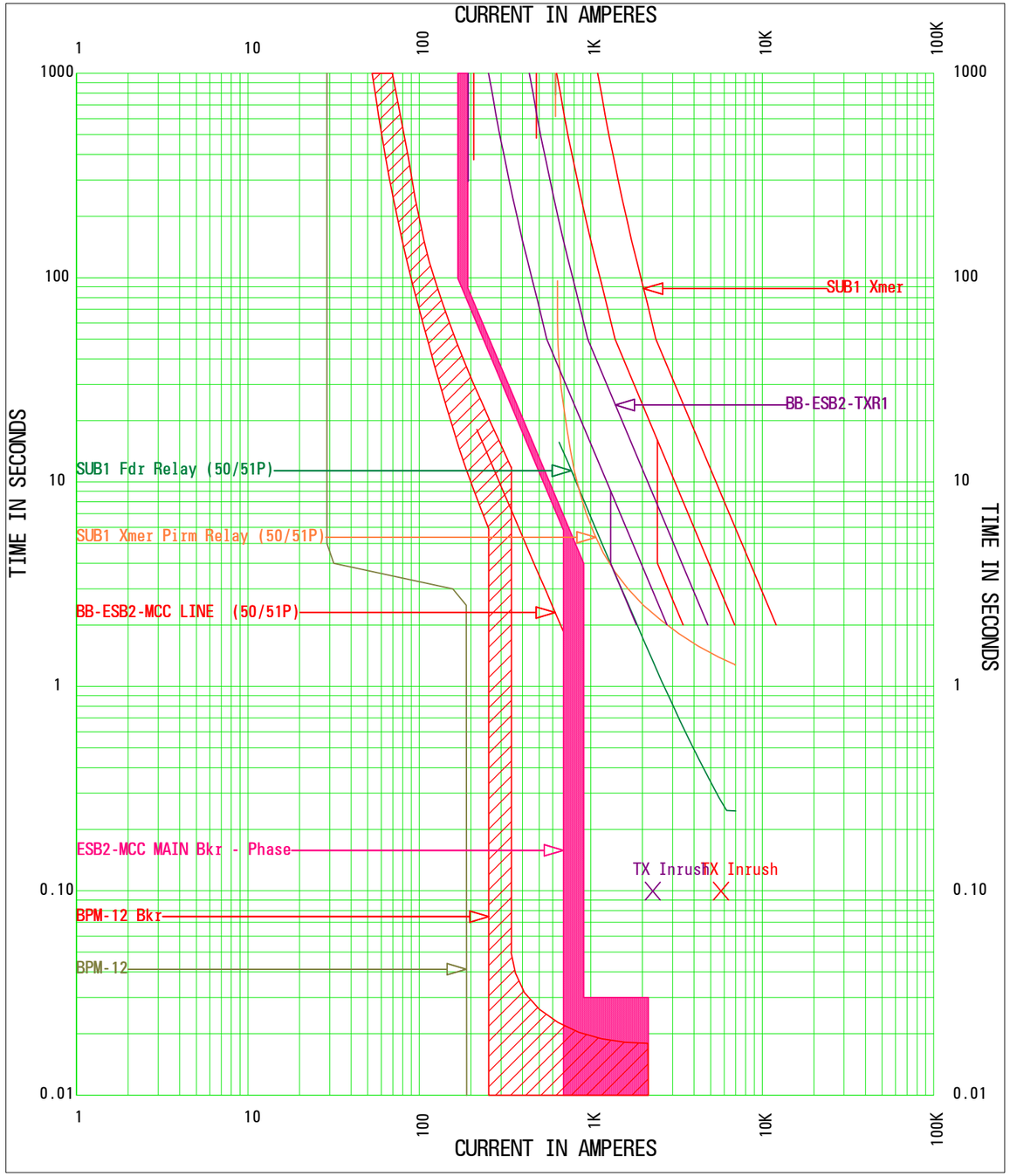
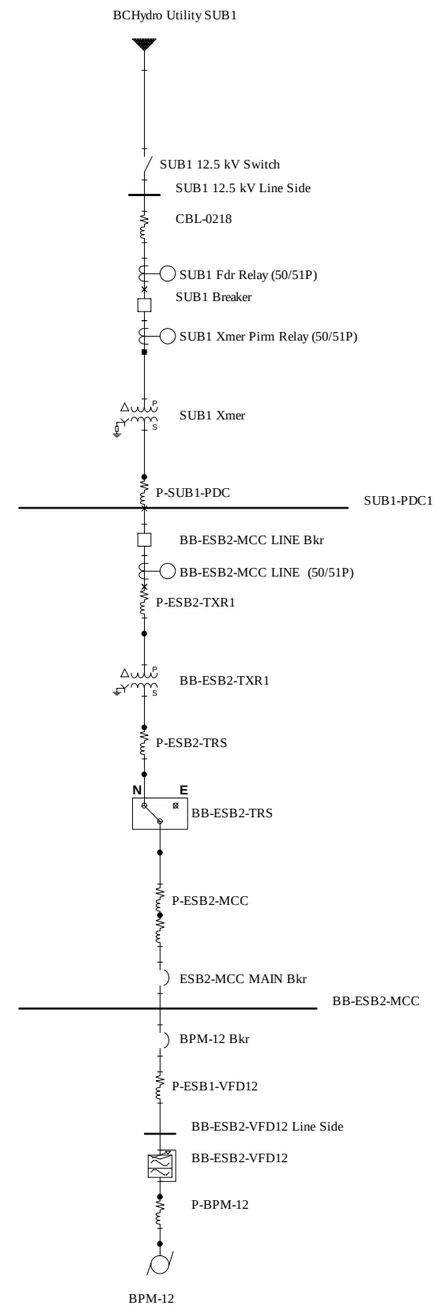

```
Device Name:     SUB1 Xmer                                  TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                        Bus Voltage:      12470.0V / 12470V
                                                            Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve         Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                                  Pri Connection:   Delta
Full Load kVA:   5000.0kVA                                  Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                     Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)              TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                        Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                        Class Desc:       845
AIC Rating:      N/A                                        Fault Duty:       3364.7A
Current Rating:  300A / 5A                                  Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Setting: 1) Phase TOC1            1 (300A)                  Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv          1.1                                    @5.0X, 1.857s
                                                                         @10.0X, 1.327s

-------------------------------------------------------------------------------------------
Device Name:     BB-ESB1-MCC LINE  (50/51P)                 TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        SUB1-PDC1                                  Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                        Class Desc:       GE-850
AIC Rating:      N/A                                        Fault Duty:       2173.0A
Current Rating:  100A / 5A                                  Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Setting: 1) 51P                   1 (100A)                  Test Points: @2.0X, 5.020s
         2) IEEE, Ext. Inverse    0.7                                    @5.0X, 0.875s
         3) 50P                   4 (400A)                               @10.0X, 0.283s

-------------------------------------------------------------------------------------------
Device Name:     BPM-11 Bkr                                 TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        BB-ESB1-MCC                                Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     300-600A
Type:            HLD
AIC Rating:      35kA                                       Fault Duty:       20739.1A
```

```
Frame:           HLD 600V 600A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Trip:            400A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     8.52 (3408A)

-----------------------------------------------------------------------------------------
Device Name:     ESB1-MCC MAIN Bkr                          TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        BB-ESB1-MCC                                Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    MERLIN GERIN
Description:     LSI, 2000A Sensor
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:65                          Fault Duty:       20739.1A
Frame:           MC20H1 600V 2000A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Sensor:          2000A
Plug:            2000A
Setting: 1) LTPU (lo x lr x S)     1; 0.8 (1600A)
         2) LTD (15-480 Sec.)      60
         3) STPU (1.5-10 x LTPU)   10 (16000A)
         4) STD (INST-0.4)         0.1         I^2 t Out
         5) INST (2-20 x S)        4 (8000A)

-----------------------------------------------------------------------------------------
Device Name:     BPM-11                                     TCC Name:         Branch #7-BB-ESB1-MCC MAINT TCC.tcc
Bus Name:        BUS-0043                                   Bus Voltage:      600.0V
                                                            Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
Description:     Motor Starting Curve                       Inrush:           6.5 (1881.4A)
Rated Size:      300HP     (1 of 1 Plotted)                 FLA+Load Adder:   289.5A + 0.0A
Power Factor:    0.8                                        Starting Time:    5.00s
Efficiency:      0.93                                       Full Voltage (Square Transient)
```





Branch #8-BB-ESB2-MCC MAINT TCC
Current Scale: x 10
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name:          Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^1
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     BB-ESB2-TXR1                                TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        BB-ESB2-TXR1 Prim Side                      Bus Voltage:      12470.0V / 600V
                                                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve          Rated Volts:      12470 LL/600 LL
Nominal kVA:     2000.0kVA                                   Pri Connection:   Delta
Full Load kVA:   2000.0kVA                                   Sec Connection:   Wye-Ground
Impedance (%Z):  6.0000                                      Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Breaker                                TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                         Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE
Description:     600-3000A
Type:            PVDB1
AIC Rating:      16kA                                        Fault Duty:       3364.7A
Frame:           PVDB1-15.5-16000 (3 Cycle) 15500V 800A      Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0

-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                     TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                         Bus Voltage:      12470.0V
Function Name:   Phase
```
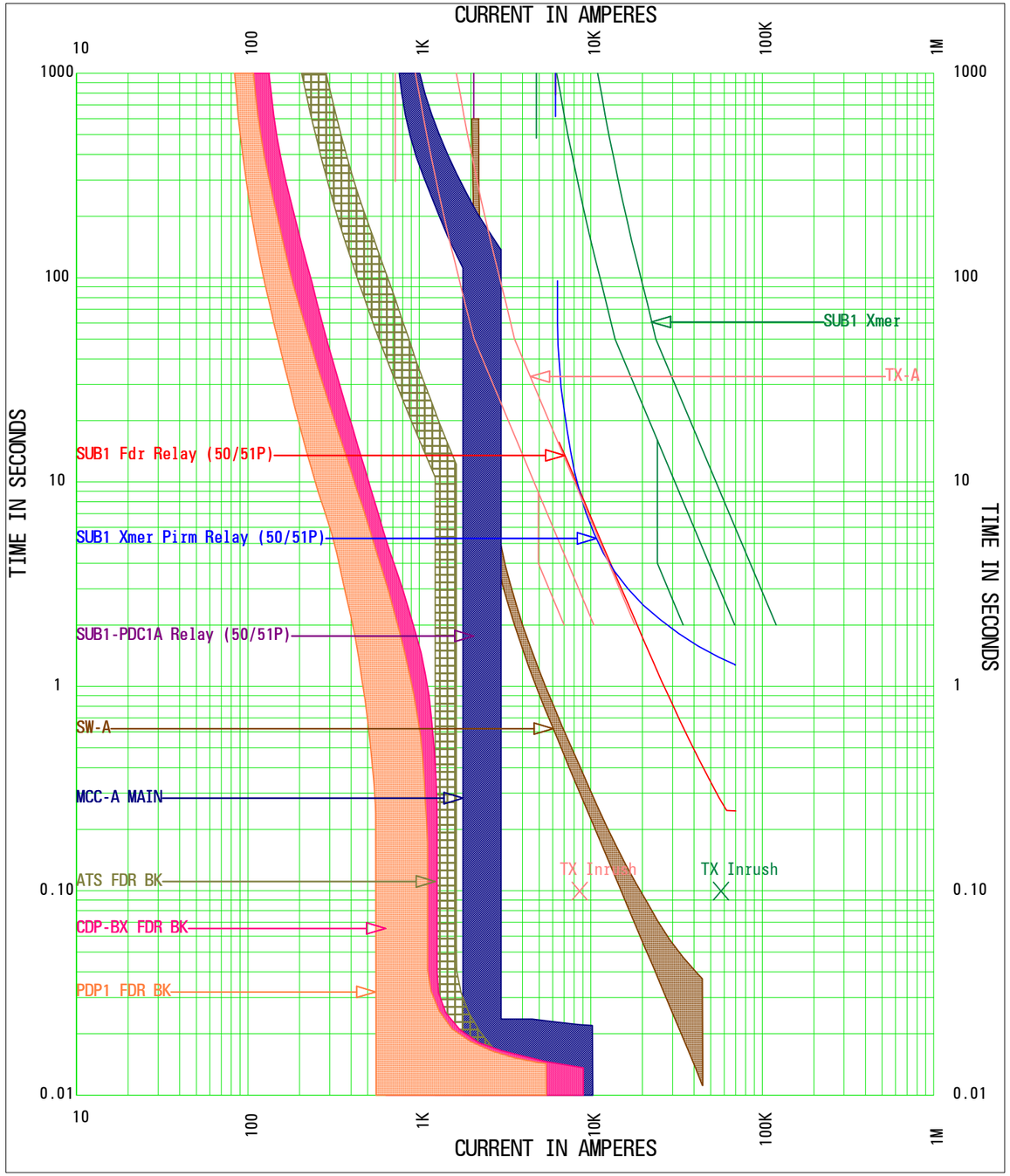
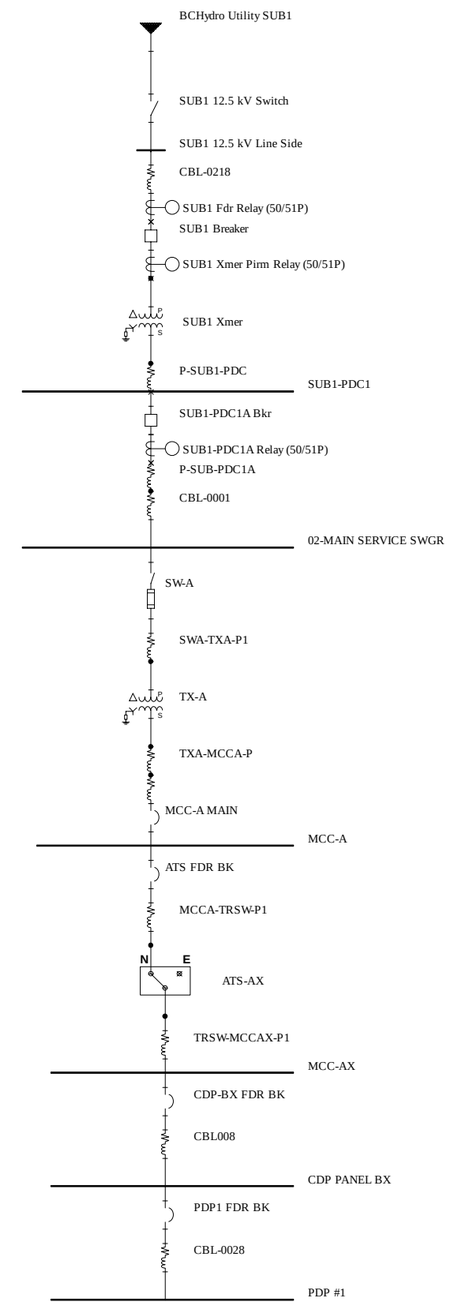

```
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-----------------------------------------------------------------------------------------
Device Name:     BB-ESB2-MCC LINE  (50/51P)             TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2173.0A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (100A)               Test Points: @2.0X, 5.020s
```

```
        2) IEEE, Ext. Inverse     0.7                                   @5.0X, 0.875s
        3) 50P                    4 (400A)                              @10.0X, 0.283s

----------------------------------------------------------------------------------------
Device Name:     BB-ESB2-MCC LINE Bkr                      TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        SUB1-PDC1                                 Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    TOSHIBA
Description:     600-3000A
Type:            VK
AIC Rating:      28kA                                      Fault Duty:       2173.0A
Frame:           VK-10M40A 15000V 1200A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0

----------------------------------------------------------------------------------------
Device Name:     BPM-12 Bkr                                TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        BB-ESB2-MCC                               Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     300-600A
Type:            HLD
AIC Rating:      35kA                                      Fault Duty:       21714.8A
Frame:           HLD 600V 600A                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            400A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     7.47 (2988A)

----------------------------------------------------------------------------------------
Device Name:     ESB2-MCC MAIN Bkr                         TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        BB-ESB2-MCC                               Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    MERLIN GERIN
Description:     LSI, 2000A Sensor
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:65                         Fault Duty:       21714.8A
Frame:           MC20H1 600V 2000A                         Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Sensor:          2000A
Plug:            2000A
Setting: 1) LTPU (lo x lr x S)     1; 0.8 (1600A)
         2) LTD (15-480 Sec.)      60
         3) STPU (1.5-10 x LTPU)   10 (16000A)
         4) STD (INST-0.4)         0.1         I^2 t Out
```

```
        5) INST (2-20 x S)        4 (8000A)

-----------------------------------------------------------------------------------------
Device Name:     BPM-12                                    TCC Name:         Branch #8-BB-ESB2-MCC MAINT TCC.tcc
Bus Name:        BUS-0059                                  Bus Voltage:      600.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           6.5 (1881.4A)
Rated Size:      300HP     (1 of 1 Plotted)                FLA+Load Adder:   289.5A + 0.0A
Power Factor:    0.8                                       Starting Time:    5.00s
Efficiency:      0.93                                      Full Voltage (Square Transient)
```





Branch #9-MCC-AX MAINT TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name:          Branch #9-MCC-AX MAINT TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     SW-A                                      TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        02-MAIN SERVICE SWGR                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    S&C
Description:     5E-200E Standard Speed
Type:            SMU-20, 14.4kV E-Rated
AIC Rating:      14kA                                      Fault Duty:       2168.4A
Cartridge:       SMU-20, 50E 12470V 50A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            50A

-------------------------------------------------------------------------------------------
Device Name:     TX-A                                      TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        BUS-0005                                  Bus Voltage:      12470.0V / 480V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/480 LL
Nominal kVA:     750.0kVA                                  Pri Connection:   Delta
Full Load kVA:   750.0kVA                                  Sec Connection:   Wye-Ground
Impedance (%Z):  5.9400                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
```
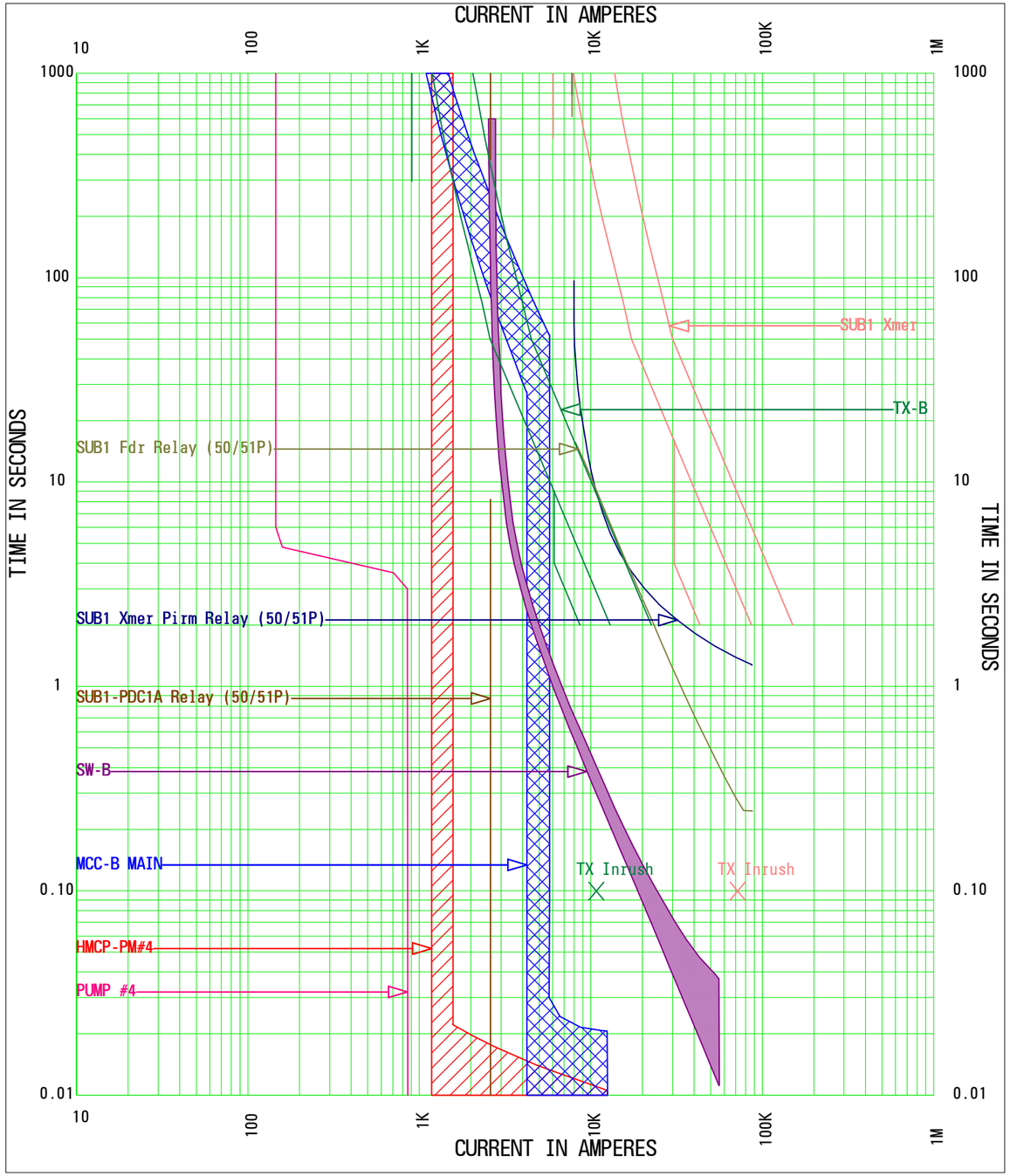
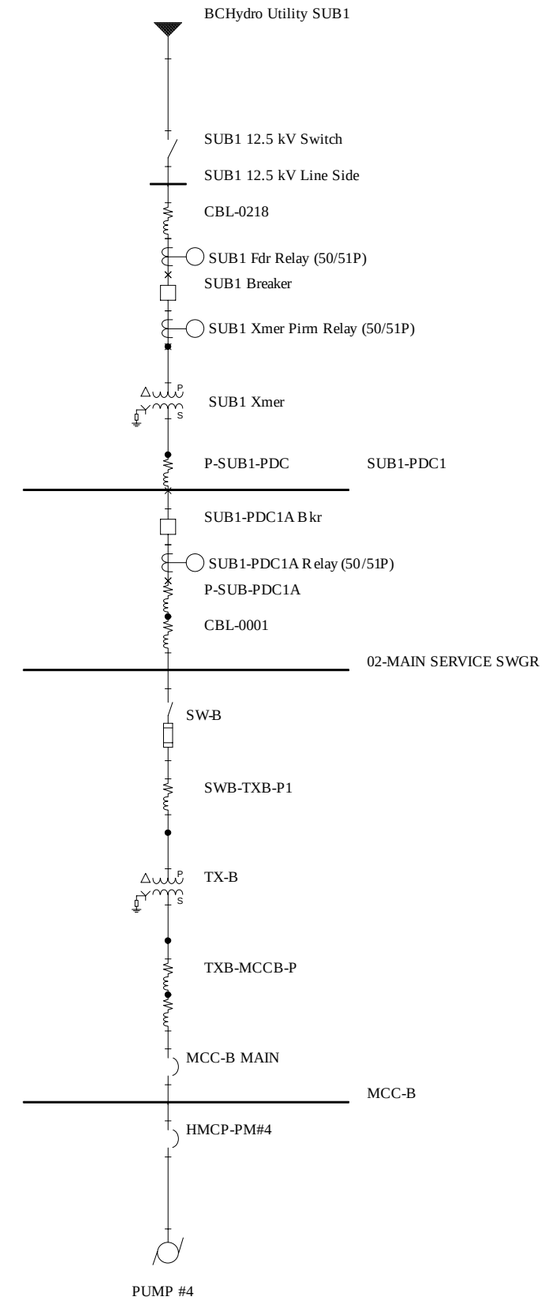

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2173.0A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
         3) 50P                    1 (100A)                             @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     PDP1 FDR BK                               TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        CDP PANEL BX                              Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FD
AIC Rating:      25kA                                      Fault Duty:       6867.6A
Frame:           FD 480V 100A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            100A
Setting: 1) Fixed

-----------------------------------------------------------------------------------------
Device Name:     ATS FDR BK                                TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        MCC-A                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    WESTINGHOUSE
Description:     100-400A
Type:            KDB, KD
AIC Rating:      35kA                                      Fault Duty:       12803.5A
Frame:           KD 480V 225A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            225A
Setting: 1) LTD
         2) INST                   8 (1800A)

-----------------------------------------------------------------------------------------
Device Name:     MCC-A MAIN                                TCC Name:         Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:        MCC-A                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     700-1200A
Type:            NB
AIC Rating:      30kA                                      Fault Duty:       12803.5A
Frame:           NB 480V 800A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            700A
Setting: 1) Thermal Curve (Fixed
         2) INST (3000-6000A)      3000 (3000A)
```

Device Name:	CDP-BX FDR BK	TCC Name:	Branch #9-MCC-AX MAINT TCC.tcc
Bus Name:	MCC-AX	Bus Voltage:	480.0V
Function Name:	Phase		
Manufacturer:	CUTLER-HAMMER		
Description:	15-225A		
Type:	HFD		
AIC Rating:	65kA	Fault Duty:	11300.7A
Frame:	HFD 480V 125A	Tcc Current Multiplier:	1
Tcc Time Multiplier:	1	Tcc Time Adder:	0
Trip:	125A		
Setting:	1) Fixed		





Branch #10-MCC-B MAINT TCC
Current Scale: x 1
Reference Voltage: 480

Project Name: Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name: Branch #10-MCC-B MAINT TCC.tcc
Reference Voltage: 480 V
Current Scale: X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current

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Device Name: SW-B
Bus Name: 02-MAIN SERVICE SWGR
Function Name: Phase
Manufacturer: S&C
Description: 5E-200E Standard Speed
Type: SMU-20, 14.4kV E-Rated
AIC Rating: 14kA
Cartridge: SMU-20, 50E 12470V 50A
Tcc Time Multiplier: 1
Size: 50A

TCC Name: Branch #10-MCC-B MAINT TCC.tcc
Bus Voltage: 12470.0V
Fault Duty: 2168.4A
Tcc Current Multiplier: 1
Tcc Time Adder: 0

Device Name: TX-B
Bus Name: BUS-0006
Tcc Time Multiplier: 1
Description: 2-Winding Transformer Damage Curve
Nominal kVA: 750.0kVA
Full Load kVA: 750.0kVA
Impedance (%Z): 6.0200

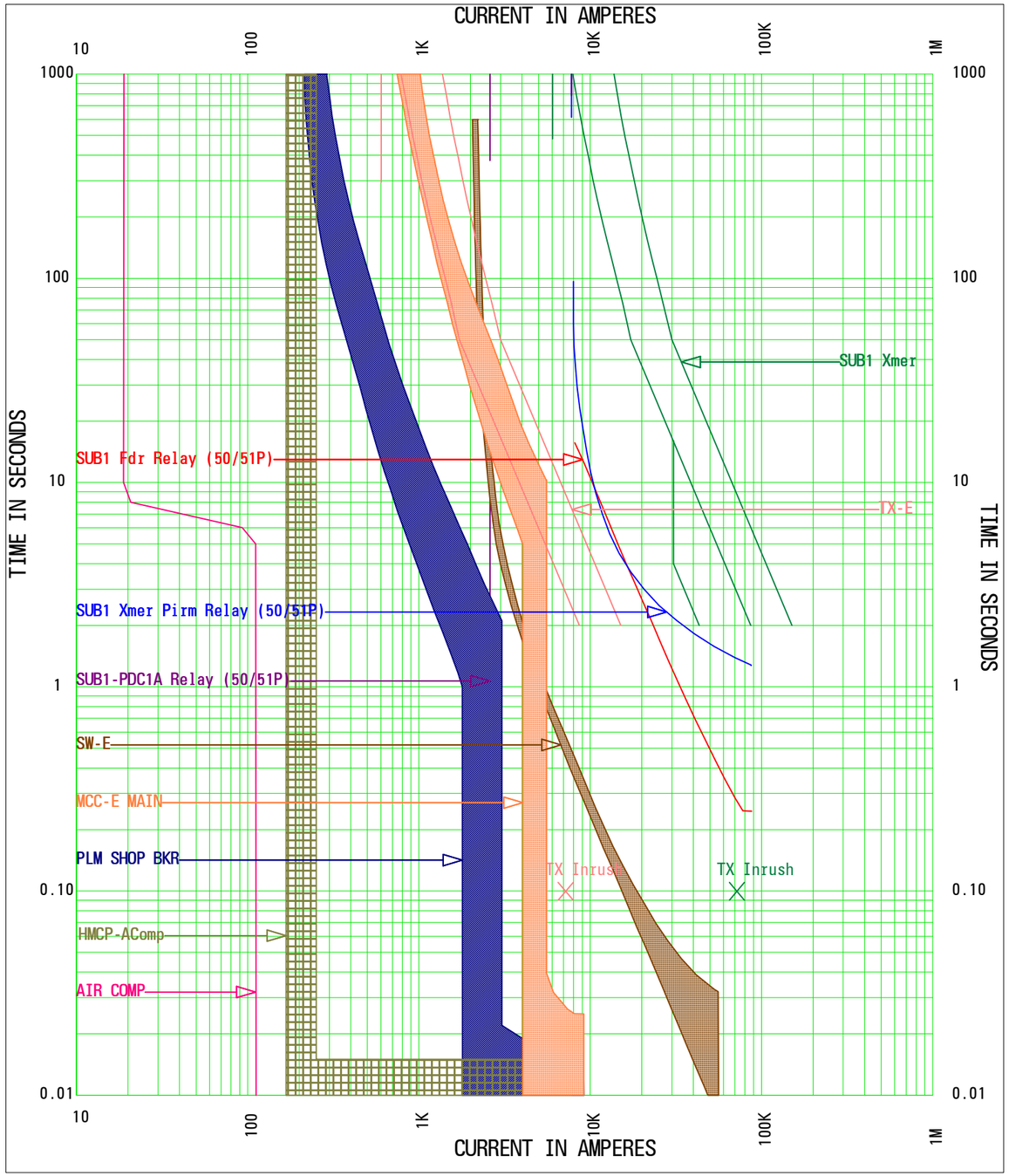
TCC Name: Branch #10-MCC-B MAINT TCC.tcc
Bus Voltage: 12470.0V / 480V
Tcc Current Multiplier: 1
Tcc Time Adder: 0
Rated Volts: 12470 LL/480 LL
Pri Connection: Delta
Sec Connection: Wye-Ground
Inrush Factor: 12.0x

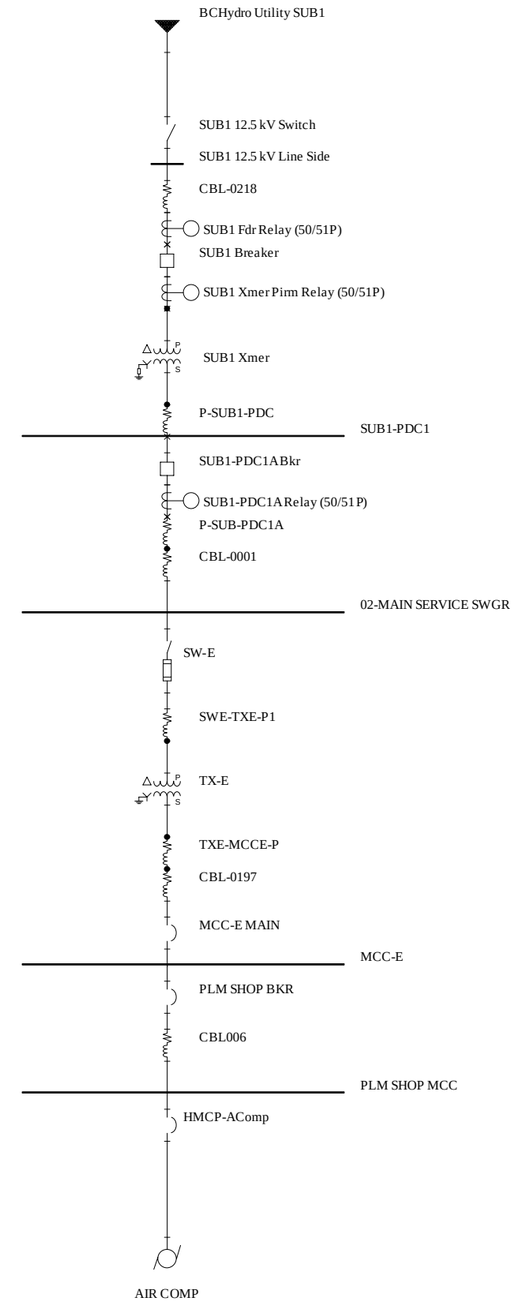
Device Name: SUB1 Fdr Relay (50/51P)
Bus Name: SUB1 Xmer Prim Side

TCC Name: Branch #10-MCC-B MAINT TCC.tcc
Bus Voltage: 12470.0V

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #10-MCC-B MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #10-MCC-B MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #10-MCC-B MAINT TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2173.0A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
         3) 50P                    1 (100A)                             @10.0X, 0.129s

-------------------------------------------------------------------------------------------
Device Name:     HMCP-PM#4                                 TCC Name:         Branch #10-MCC-B MAINT TCC.tcc
Bus Name:        MCC-B                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     250A (1000-2000A Inst)
Type:            HMCP
AIC Rating:      65kA                                      Fault Duty:       12500.3A
Frame:           HMCP 480V 250A                            Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Setting: 1) INST (1000-2000A)      D (1375A)

-------------------------------------------------------------------------------------------
Device Name:     MCC-B MAIN                                TCC Name:         Branch #10-MCC-B MAINT TCC.tcc
Bus Name:        MCC-B                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     125-800A
Type:            MA
AIC Rating:      30kA                                      Fault Duty:       12500.3A
Frame:           MA 480V 800A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            800A
Setting: 1) Thermal Curve (Fixed
         2) INST (3000-6000A)      5000 (5000A)

-------------------------------------------------------------------------------------------
Device Name:     PUMP #4                                   TCC Name:         Branch #10-MCC-B MAINT TCC.tcc
Bus Name:        MCC-B                                     Bus Voltage:      480.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           5.9 (855.5A)
Rated Size:      125HP     (1 of 1 Plotted)                FLA+Load Adder:   145.0A + 0.0A
Power Factor:    0.832                                     Starting Time:    6.00s
Efficiency:      0.93                                      Full Voltage (Square Transient)
```





Branch #11-MCC-E MAINT TCC
Current Scale: x 1
Reference Voltage: 480

```
Project Name:      Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name:          Branch #11-MCC-E MAINT TCC.tcc
Reference Voltage: 480 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


-------------------------------------------------------------------------------------------
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-------------------------------------------------------------------------------------------
Device Name:     SW-E                                      TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        02-MAIN SERVICE SWGR                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    S&C
Description:     5E-200E Standard Speed
Type:            SMU-20, 14.4kV E-Rated
AIC Rating:      14kA                                      Fault Duty:       2168.4A
Cartridge:       SMU-20, 40E 12470V 40A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            40A

-------------------------------------------------------------------------------------------
Device Name:     TX-E                                      TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        BUS-0007                                  Bus Voltage:      12470.0V / 480V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/480 LL
Nominal kVA:     500.0kVA                                  Pri Connection:   Delta
Full Load kVA:   625.0kVA                                  Sec Connection:   Wye-Ground
Impedance (%Z):  4.6000                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
```
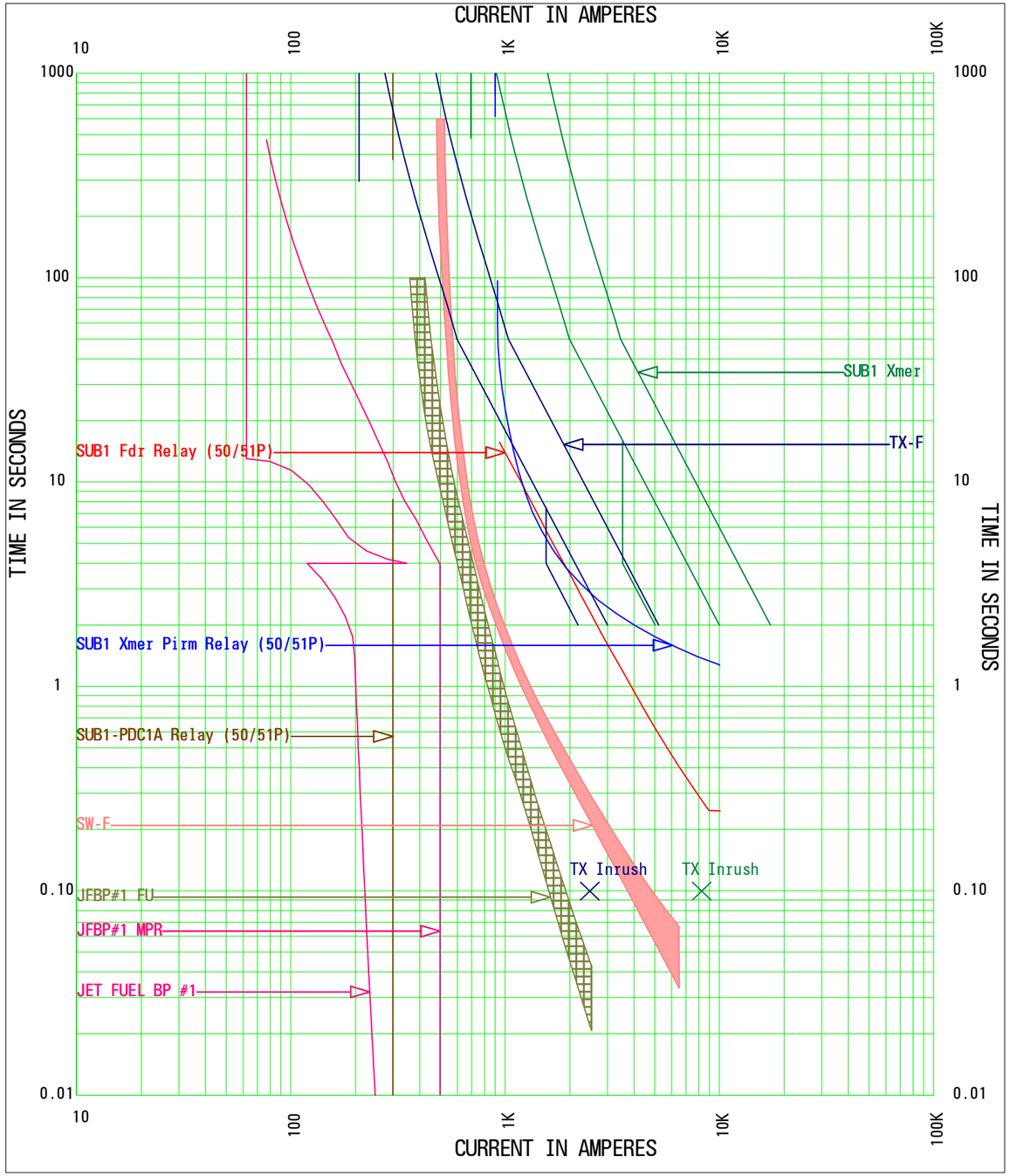
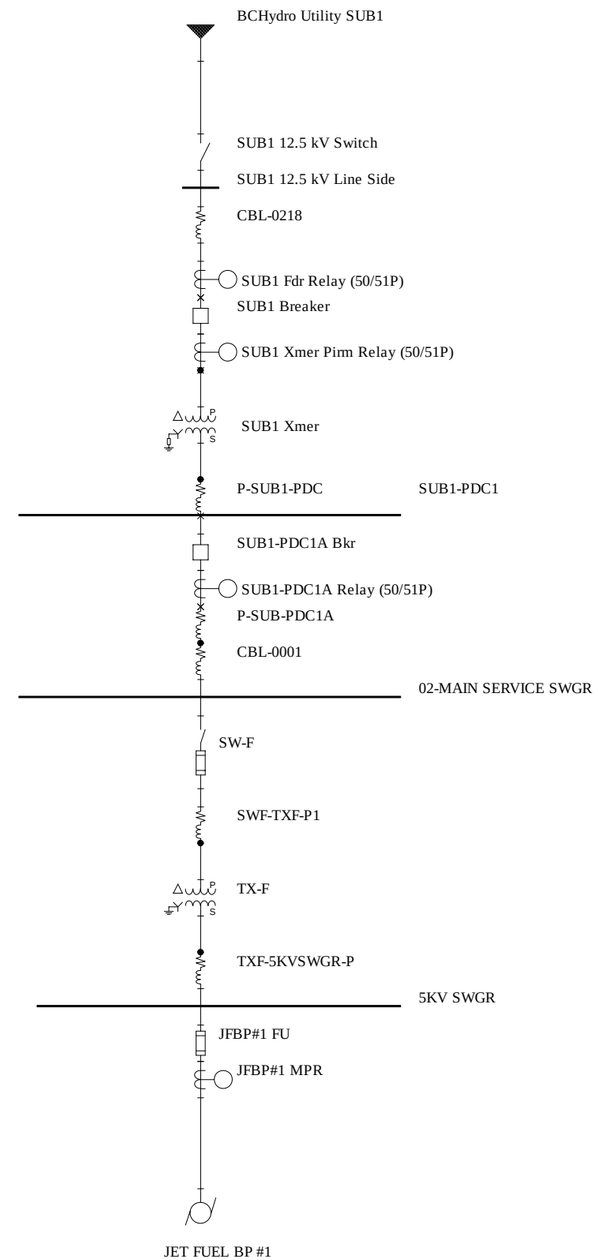

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2173.0A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
         3) 50P                    1 (100A)                             @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     MCC-E MAIN                                TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        MCC-E                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    WESTINGHOUSE
Description:     125-600A
Type:            HLA
AIC Rating:      35kA                                      Fault Duty:       9195.3A
Frame:           HLA 480V 600A                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            600A
Setting: 1) LTD
         2) INST                   8 (4800A)

-----------------------------------------------------------------------------------------
Device Name:     PLM SHOP BKR                              TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        MCC-E                                     Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FDC
AIC Rating:      100kA                                     Fault Duty:       9195.3A
Frame:           FDC 480V 200A                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            200A
Setting: 1) Fixed

-----------------------------------------------------------------------------------------
Device Name:     AIR COMP                                  TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        PLM SHOP MCC                              Bus Voltage:      480.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           5.9 (112.1A)
Rated Size:      15HP      (1 of 1 Plotted)                FLA+Load Adder:   19.0A + 0.0A
Power Factor:    0.85                                      Starting Time:    10.00s
Efficiency:      0.93                                      Full Voltage (Square Transient)
-----------------------------------------------------------------------------------------
Device Name:     HMCP-AComp                                TCC Name:         Branch #11-MCC-E MAINT TCC.tcc
Bus Name:        PLM SHOP MCC                              Bus Voltage:      480.0V
Function Name:   Phase
```

```
Manufacturer:    CUTLER-HAMMER
Description:     30A (90-300A Inst)
Type:            HMCP
AIC Rating:      65kA                                    Fault Duty:       7741.9A
Frame:           HMCP 480V 30A                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                   Tcc Time Adder:       0
Setting: 1) INST (90-300A)         E (210A)
```





Branch #12-5kV SWGR MAINT TCC
Current Scale: x 1
Reference Voltage: 4160

```
Project Name:      Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name:          Branch #12-5kV SWGR MAINT TCC.tcc
Reference Voltage: 4160 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     SW-F                                      TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        02-MAIN SERVICE SWGR                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    S&C
Description:     5E-200E Standard Speed
Type:            SMU-20, 14.4kV E-Rated
AIC Rating:      14kA                                      Fault Duty:       2168.4A
Cartridge:       SMU-20, 80E 12470V 80A                    Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            80A

-------------------------------------------------------------------------------------------
Device Name:     TX-F                                      TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        BUS-0008                                  Bus Voltage:      12470.0V / 4160V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                                 Pri Connection:   Delta
Full Load kVA:   1680.0kVA                                 Sec Connection:   Wye-Ground
Impedance (%Z):  5.4800                                    Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     SUB1 Fdr Relay (50/51P)                   TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                       Bus Voltage:      12470.0V
```
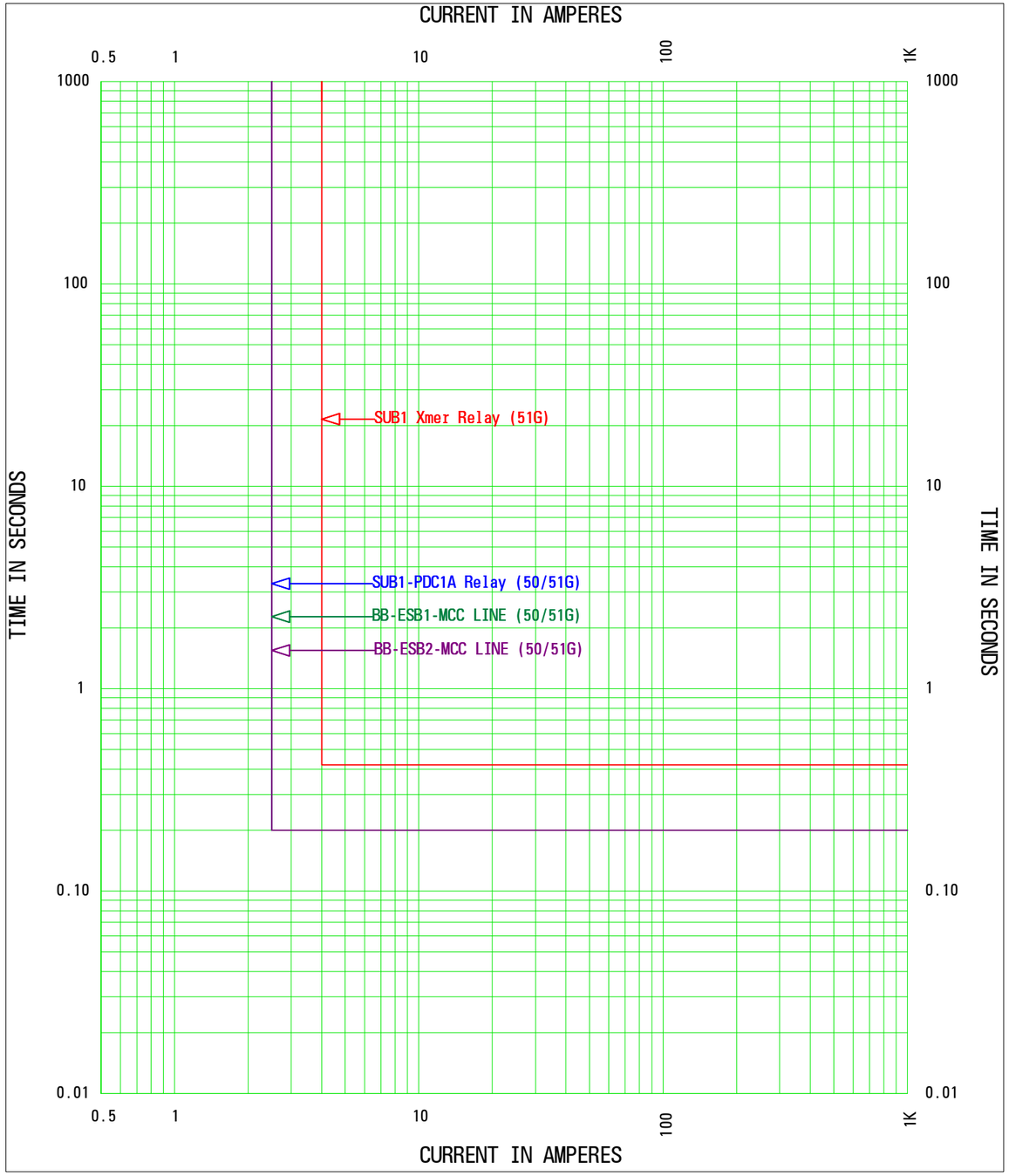
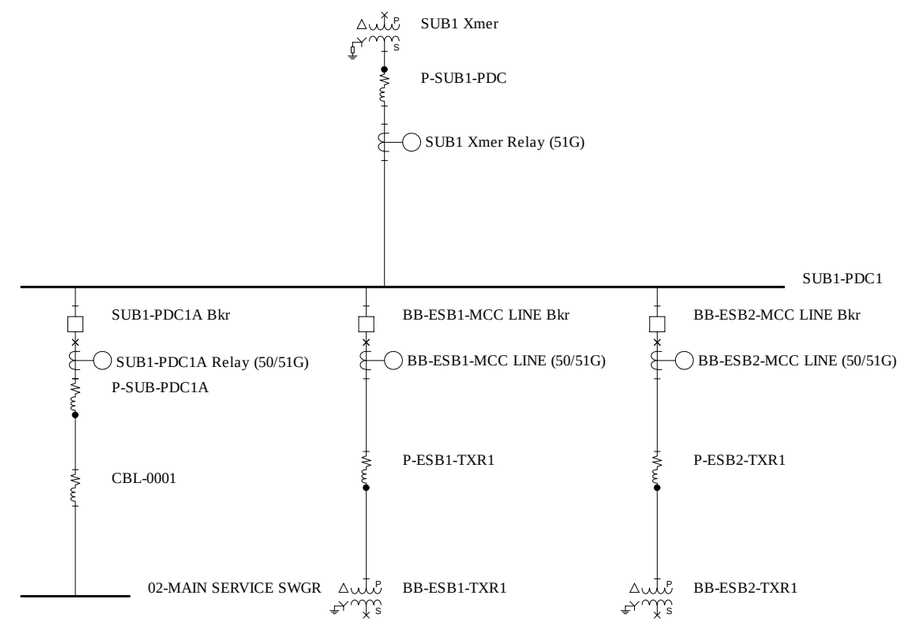

```
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                  1 (300A)               Test Points: @2.0X, 4.375s
         2) IEEE, Ext. Inverse   0.61                                @5.0X, 0.762s
                                                                     @10.0X, 0.246s

-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer                              TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V / 12470V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      12470 LL/12470 LL
Nominal kVA:     5000.0kVA                              Pri Connection:   Delta
Full Load kVA:   5000.0kVA                              Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                 Inrush Factor:    12.0x
-----------------------------------------------------------------------------------------
Device Name:     SUB1 Xmer Pirm Relay (50/51P)          TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        SUB1 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       3364.7A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1           1 (300A)               Test Points: @2.0X, 4.184s
         2) IEEE Mod Inv         1.1                                 @5.0X, 1.857s
                                                                     @10.0X, 1.327s

-----------------------------------------------------------------------------------------
Device Name:     SUB1-PDC1A Relay (50/51P)              TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        SUB1-PDC1                              Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2173.0A
Current Rating:  100A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

```
Setting: 1) 51P                    1 (100A)                Test Points: @2.0X, 2.295s
         2) IEEE, Ext. Inverse     0.32                                 @5.0X, 0.400s
         3) 50P                    1 (100A)                             @10.0X, 0.129s

-----------------------------------------------------------------------------------------
Device Name:     JET FUEL BP #1                            TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        5KV SWGR                                  Bus Voltage:      4160.0V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     Motor Starting Curve                      Inrush:           4.0 (248.0A)
Rated Size:      500HP     (1 of 1 Plotted)                FLA+Load Adder:   62.0A + 0.0A
Power Factor:    0.898                                     Starting Time:    10.00s
Efficiency:      0.93                                      Auto Transformer
-----------------------------------------------------------------------------------------
Device Name:     JFBP#1 FU                                 TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        5KV SWGR                                  Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    BUSSMANN
Description:     30A & 2R-24R
Type:            JCL-B, 5.08kV R-Rated
AIC Rating:      50kA                                      Fault Duty:       2534.5A
Cartridge:       JCL-B-4R 5080V 130A                       Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Size:            130A

-----------------------------------------------------------------------------------------
Device Name:     JFBP#1 MPR                                TCC Name:         Branch #12-5kV SWGR MAINT TCC.tcc
Bus Name:        5KV SWGR                                  Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     49/50
Type:            269 Plus                                  Class Desc:       269 Plus
Fault Duty:      2534.5A                                   Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Current Rating:  100A / 5A                                 FLA:              62.00A
Setting: 1) O/L Pickup             1.25 (77.5A)            Test Points: @2.0X, 87.000s
         2) O/L Curves             Curve 3                              @5.0X, 10.000s
         3) S/C Trip               8 (496A)                             @10.0X, 4.000s
```





Branch #13-SHELLMONT MV GROUND FAULT TCC
Current Scale: x 1
Reference Voltage: 12470

```
 Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
 TCC Name:          Branch #13-SHELLMONT MV GROUND FAULT TCC.tcc
 Reference Voltage: 12470 V
 Current Scale:     X 10^0
 TCC Notes:
 TCC Comment:
 Fault Duty Option: Study Result - Bus Fault Current


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 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB1-MCC LINE (50/51G)                TCC Name:         Branch #13-SHELLMONT MV GROUND
FAULT TCC.tcc
 Bus Name:        SUB1-PDC1                                Bus Voltage:      12470.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                      Class Desc:       GE-850
 AIC Rating:      N/A                                      Fault Duty:       15.0A
 Current Rating:  50A / 5A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
 Setting: 1) 50G                  0.05 (2.5A)              Test Points: @2.0X, 0.200s
          2) Definite Time        0.2 (seconds)                         @5.0X, 0.200s
                                                                        @10.0X, 0.200s

 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB2-MCC LINE (50/51G)                TCC Name:         Branch #13-SHELLMONT MV GROUND
FAULT TCC.tcc
 Bus Name:        SUB1-PDC1                                Bus Voltage:      12470.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                      Class Desc:       GE-850
 AIC Rating:      N/A                                      Fault Duty:       15.0A
 Current Rating:  50A / 5A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
 Setting: 1) 50G                  0.05 (2.5A)              Test Points: @2.0X, 0.200s
          2) Definite Time        0.2 (seconds)                         @5.0X, 0.200s
```
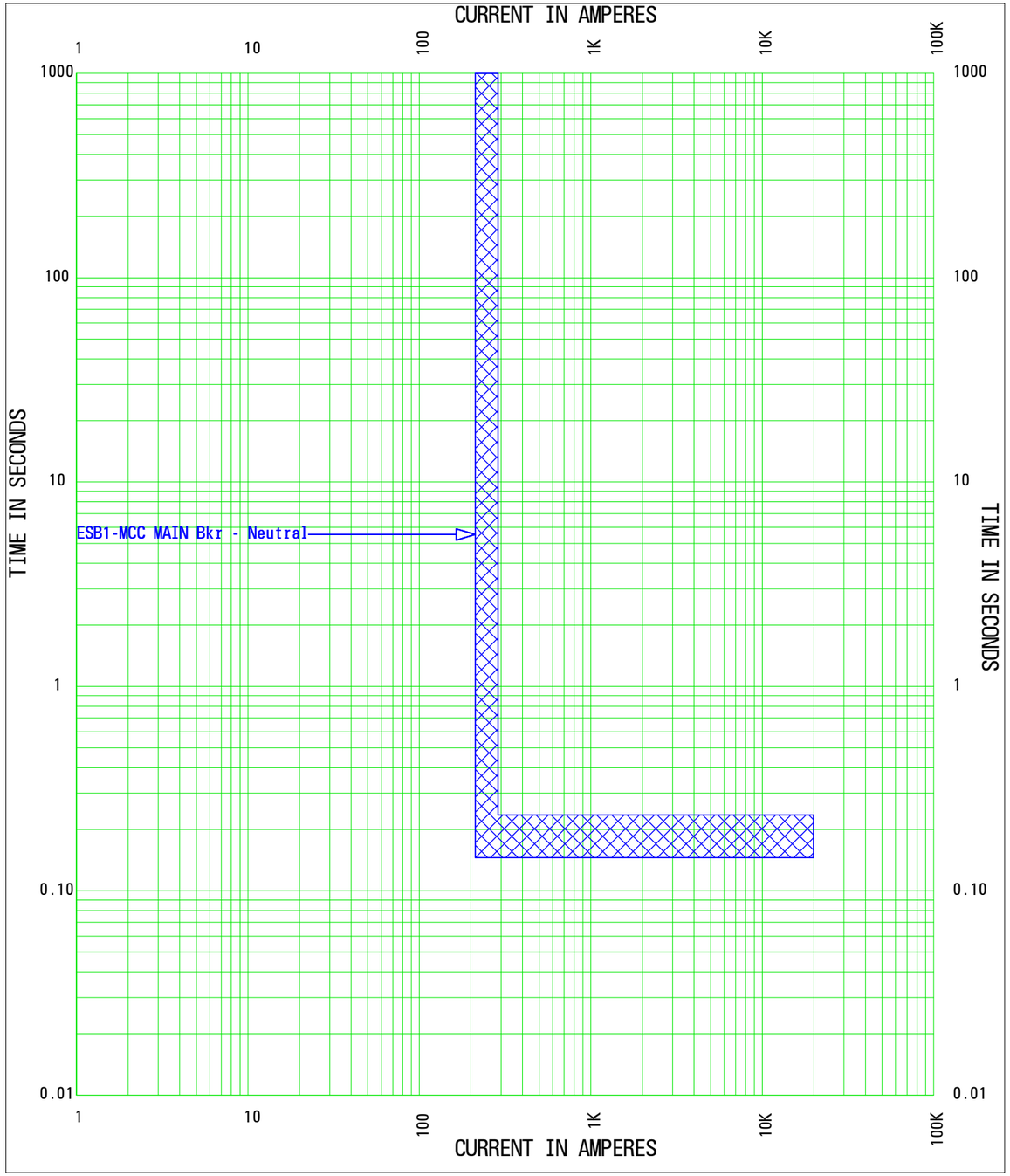
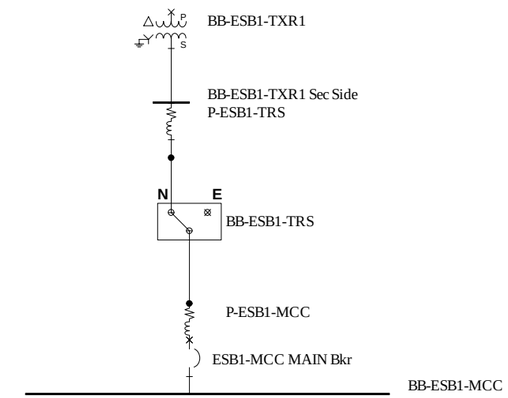

```
                                                                    @10.0X, 0.200s

 ----------------------------------------------------------------------------------------
 Device Name:     SUB1 Xmer Relay (51G)                    TCC Name:         Branch #13-SHELLMONT MV GROUND
FAULT TCC.tcc
 Bus Name:        SUB1-PDC1                                Bus Voltage:      12470.0V
 Function Name:   Neutral
 Manufacturer:    STARTCO
 Description:     50/ 51G/ 51N, CT200
 Type:            SE-325                                   Class Desc:       SE-325
 AIC Rating:      N/A                                      Fault Duty:       15.0A
 Current Rating:  200A / 5A                                Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
 Setting: 1) GF Trip Level          4 (4A)                 Test Points: @2.0X, 0.420s
          2) GF Trip Time           0.42 (seconds)                      @5.0X, 0.419s
                                                                        @10.0X, 0.419s

 ----------------------------------------------------------------------------------------
 Device Name:     SUB1-PDC1A Relay (50/51G)                TCC Name:         Branch #13-SHELLMONT MV GROUND
FAULT TCC.tcc
 Bus Name:        SUB1-PDC1                                Bus Voltage:      12470.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                      Class Desc:       GE-850
 AIC Rating:      N/A                                      Fault Duty:       15.0A
 Current Rating:  50A / 5A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
 Setting: 1) 50G                    0.05 (2.5A)            Test Points: @2.0X, 0.200s
          2) Definite Time          0.2 (seconds)                       @5.0X, 0.200s
                                                                        @10.0X, 0.200s
```





Branch #14-BB-ESB1-MCC GROUND FAULT TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #14-BB-ESB1-MCC GROUND FAULT TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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--------------------------------------------------------------------------------------------
Device Name:     ESB1-MCC MAIN Bkr                        TCC Name:         Branch #14-BB-ESB1-MCC GROUND FAULT
TCC.tcc
Bus Name:        BB-ESB1-MCC                              Bus Voltage:      600.0V
Function Name:   Neutral
Manufacturer:    MERLIN GERIN
Description:     GF, 1600-2500A Sensors
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:65                        Fault Duty:       19941.7A
Frame:           MC20H1 600V 2000A                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Sensor:          2000A
Plug:            2000A
Setting: 1) GFPU (250-1200A)       250A (250A)
         2) GFD (0.1-0.4)          0.2         I^2 t Out
```

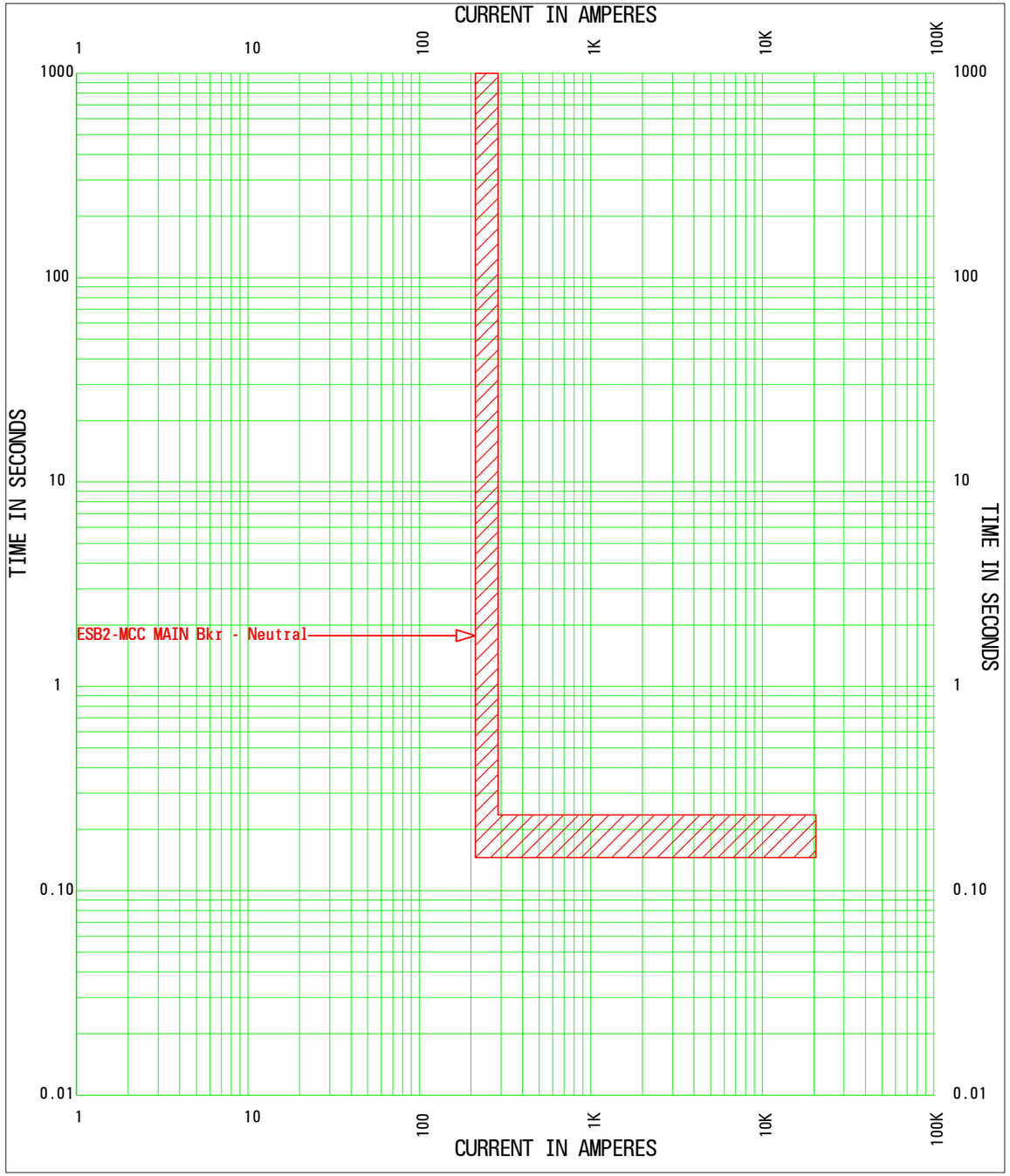

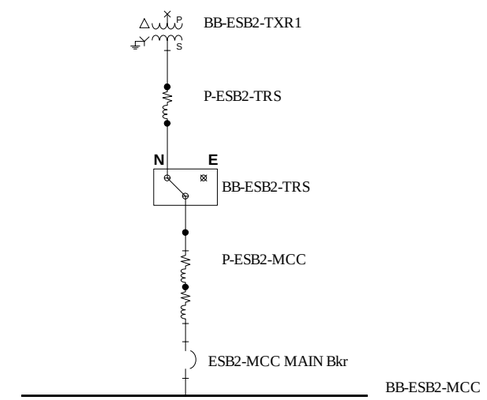

Branch #15-BB-ESB2-MCC GROUND FAULT TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #15-BB-ESB2-MCC GROUND FAULT TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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--------------------------------------------------------------------------------------------
Device Name:     ESB2-MCC MAIN Bkr                        TCC Name:         Branch #15-BB-ESB2-MCC GROUND FAULT
TCC.tcc
Bus Name:        BB-ESB2-MCC                              Bus Voltage:      600.0V
Function Name:   Neutral
Manufacturer:    MERLIN GERIN
Description:     GF, 1600-2500A Sensors
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:65                        Fault Duty:       20501.6A
Frame:           MC20H1 600V 2000A                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Sensor:          2000A
Plug:            2000A
Setting: 1) GFPU (250-1200A)       250A (250A)
         2) GFD (0.1-0.4)          0.2         I^2 t Out
```

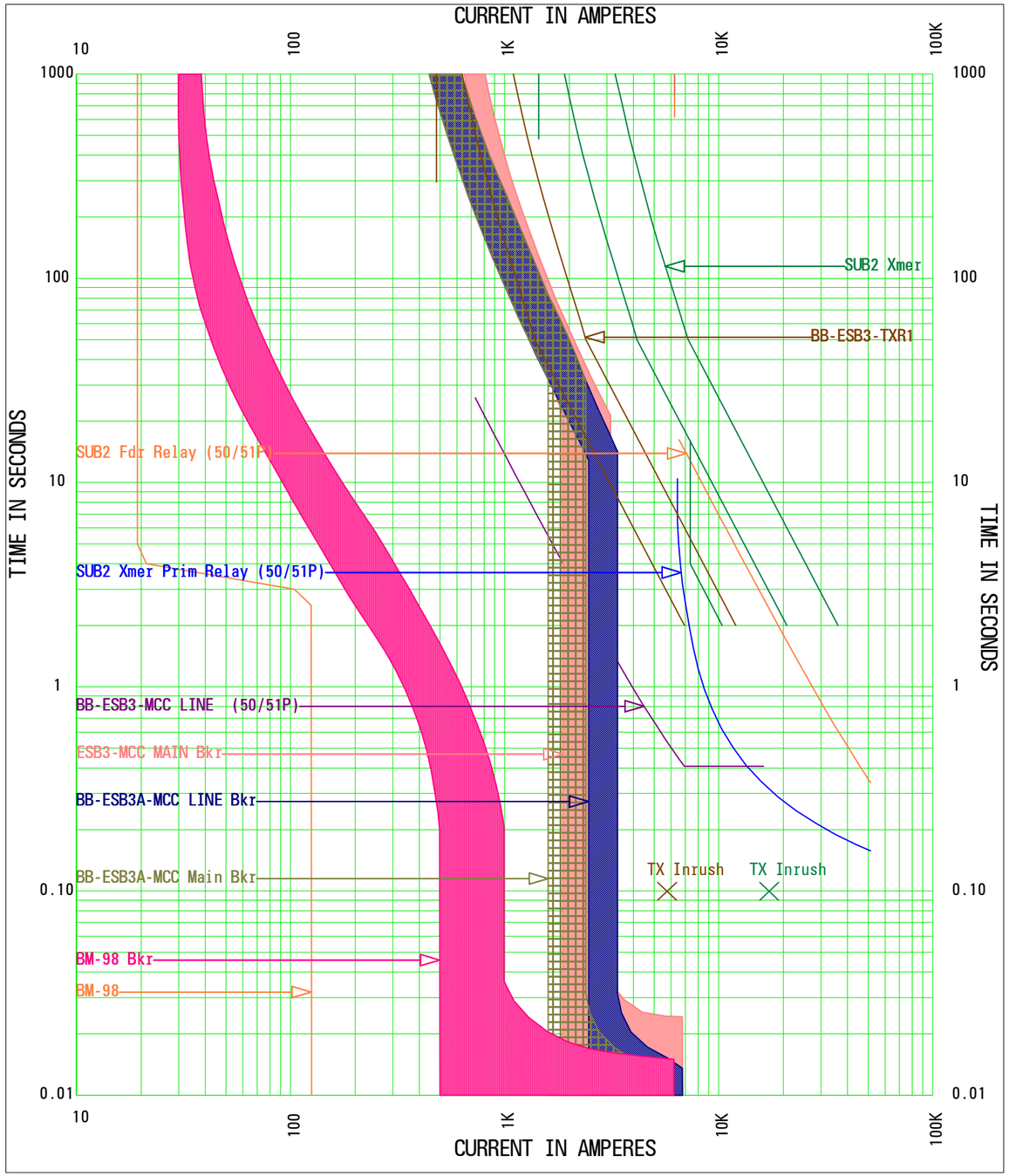

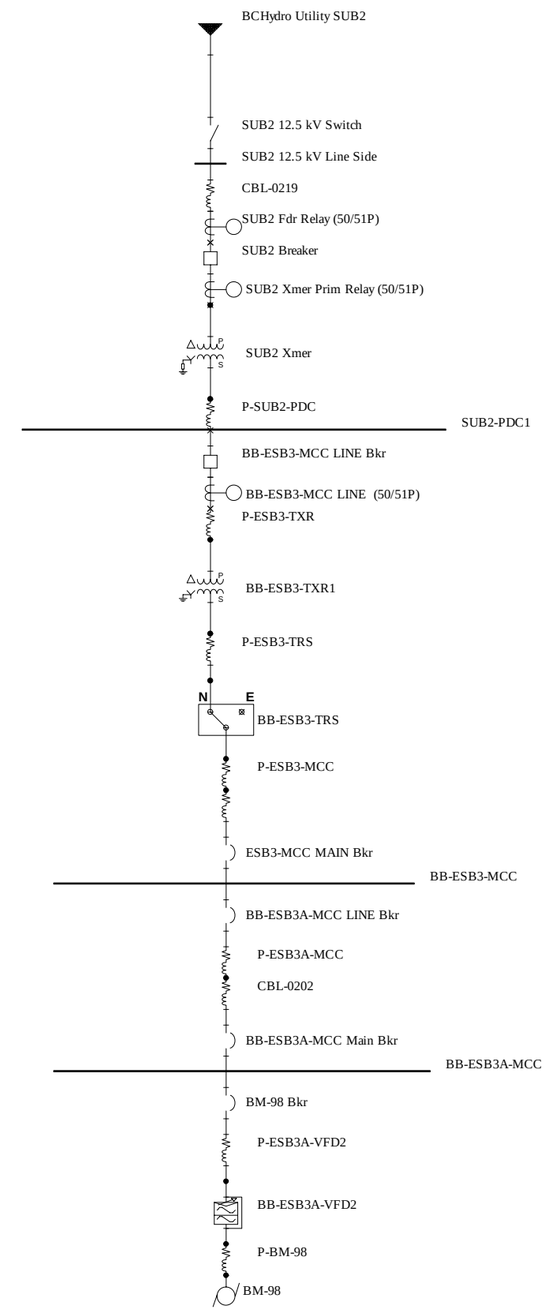

Branch #1-BB-ESB3A-MCC IN-SVC TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #1-BB-ESB3A-MCC IN-SVC TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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--------------------------------------------------------------------------------------------
Device Name:     SUB2 Fdr Relay (50/51P)                   TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                       Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                       Class Desc:       GE-850
AIC Rating:      N/A                                       Fault Duty:       2474.1A
Current Rating:  300A / 5A                                 Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Setting: 1) 51P                   1 (300A)                 Test Points: @2.0X, 4.518s
         2) IEEE, Ext. Inverse    0.63                                  @5.0X, 0.787s
                                                                        @10.0X, 0.254s

--------------------------------------------------------------------------------------------
Device Name:     SUB2 Xmer                                 TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                       Bus Voltage:      12470.0V / 4160V
                                                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                                 Pri Connection:   Delta
Full Load kVA:   1500.0kVA                                 Sec Connection:   Wye-Ground
```
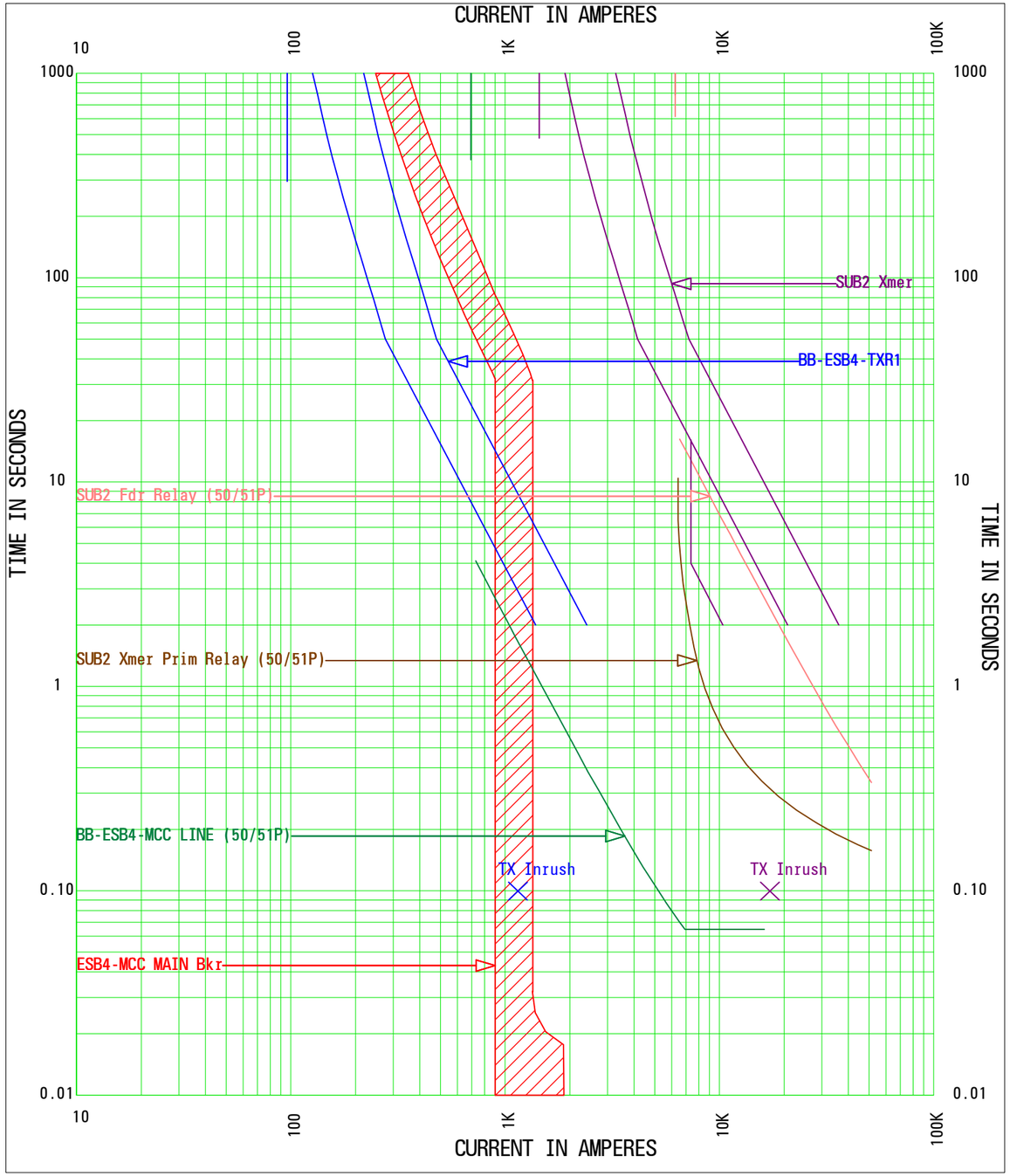
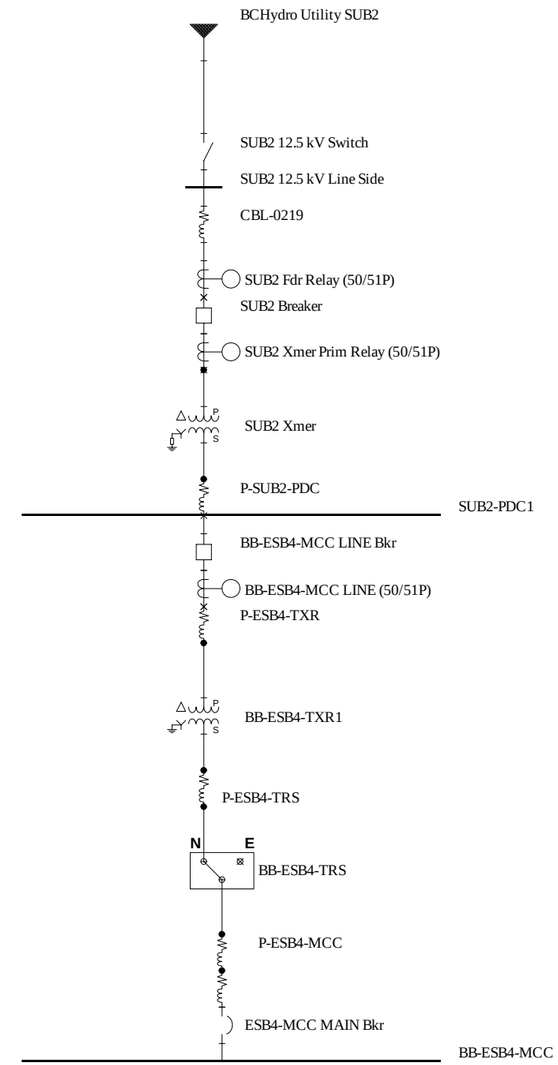

```
 Impedance (%Z):  8.0000                                    Inrush Factor:    12.0x
 ---------------------------------------------------------------------------------------
 Device Name:     SUB2 Xmer Prim Relay (50/51P)             TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
 Bus Name:        SUB2 Xmer Prim Side                       Bus Voltage:      12470.0V
 Function Name:   Phase
 Manufacturer:    GE MULTILIN
 Description:     50/51P
 Type:            845                                       Class Desc:       845
 AIC Rating:      N/A                                       Fault Duty:       2474.1A
 Current Rating:  300A / 5A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) Phase TOC1            1 (300A)                 Test Points: @2.0X, 0.456s
          2) IEEE Mod Inv          0.12                                  @5.0X, 0.203s
                                                                         @10.0X, 0.145s

 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB3-TXR1                              TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
 Bus Name:        BB-ESB3-TXR1 Prim Side                    Bus Voltage:      4160.0V / 600V
                                                            Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Description:     2-Winding Transformer Damage Curve        Rated Volts:      4160 LL/600 LL
 Nominal kVA:     500.0kVA                                  Pri Connection:   Delta
 Full Load kVA:   500.0kVA                                  Sec Connection:   Wye-Ground
 Impedance (%Z):  5.0000                                    Inrush Factor:    12.0x
 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB3-MCC LINE  (50/51P)                TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Phase
 Manufacturer:    GE MULTILIN
 Description:     50/51P
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       2337.7A
 Current Rating:  100A / 1A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 51P                   1 (100A)                 Test Points: @2.0X, 7.243s
          2) IEEE, Ext. Inverse    1.01                                  @5.0X, 1.262s
                                                                         @10.0X, 0.408s

 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB3A-MCC LINE Bkr                     TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
```

```
 Bus Name:        BB-ESB3-MCC                                Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     100-400A
 Type:            HKD
 AIC Rating:      35kA                                       Fault Duty:       6777.3A
 Frame:           HKD 600V 400A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
 Trip:            400A
 Setting: 1) Thermal Curve (Fixed
          2) INST (5-10 x Trip)     7.31 (2924A)

 ----------------------------------------------------------------------------------------
 Device Name:     ESB3-MCC MAIN Bkr                          TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
 Bus Name:        BB-ESB3-MCC                                Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     70-600A
 Type:            HLA
 AIC Rating:      25kA                                       Fault Duty:       6777.3A
 Frame:           HLA 600V 600A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
 Trip:            500A
 Setting: 1) Thermal Curve (Fixed
          2) INST (5-10 x Trip)     5 (2500A)

 ----------------------------------------------------------------------------------------
 Device Name:     BB-ESB3A-MCC Main Bkr                      TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
 Bus Name:        BB-ESB3A-MCC                               Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     100-400A
 Type:            HKD
 AIC Rating:      35kA                                       Fault Duty:       6186.0A
 Frame:           HKD 600V 400A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
 Trip:            400A
 Setting: 1) Thermal Curve (Fixed
          2) INST (5-10 x Trip)     5 (2000A)

 ----------------------------------------------------------------------------------------
 Device Name:     BM-98 Bkr                                  TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
```

```
TCC.tcc
 Bus Name:        BB-ESB3A-MCC                              Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     15-225A
 Type:            FDC
 AIC Rating:      35kA                                      Fault Duty:       6186.0A
 Frame:           FDC 600V 30A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Trip:            30A
 Setting: 1) Fixed

 ----------------------------------------------------------------------------------------
 Device Name:     BM-98                                     TCC Name:         Branch #1-BB-ESB3A-MCC IN-SVC
TCC.tcc
 Bus Name:        BUS-0119                                  Bus Voltage:      600.0V
                                                            Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Description:     Motor Starting Curve                      Inrush:           6.5 (125.4A)
 Rated Size:      20HP      (1 of 1 Plotted)                FLA+Load Adder:   19.3A + 0.0A
 Power Factor:    0.8                                       Starting Time:    5.00s
 Efficiency:      0.93                                      Full Voltage (Square Transient)
```





Branch #2-BB-ESB4-MCC IN-SVC TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     SUB2 Fdr Relay (50/51P)                  TCC Name:         Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                      Class Desc:       GE-850
AIC Rating:      N/A                                      Fault Duty:       2474.1A
Current Rating:  300A / 5A                                Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Setting: 1) 51P                    1 (300A)               Test Points: @2.0X, 4.518s
         2) IEEE, Ext. Inverse     0.63                                @5.0X, 0.787s
                                                                       @10.0X, 0.254s

-------------------------------------------------------------------------------------------
Device Name:     SUB2 Xmer                                TCC Name:         Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V / 4160V
                                                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve       Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                                Pri Connection:   Delta
Full Load kVA:   1500.0kVA                                Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                   Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
```
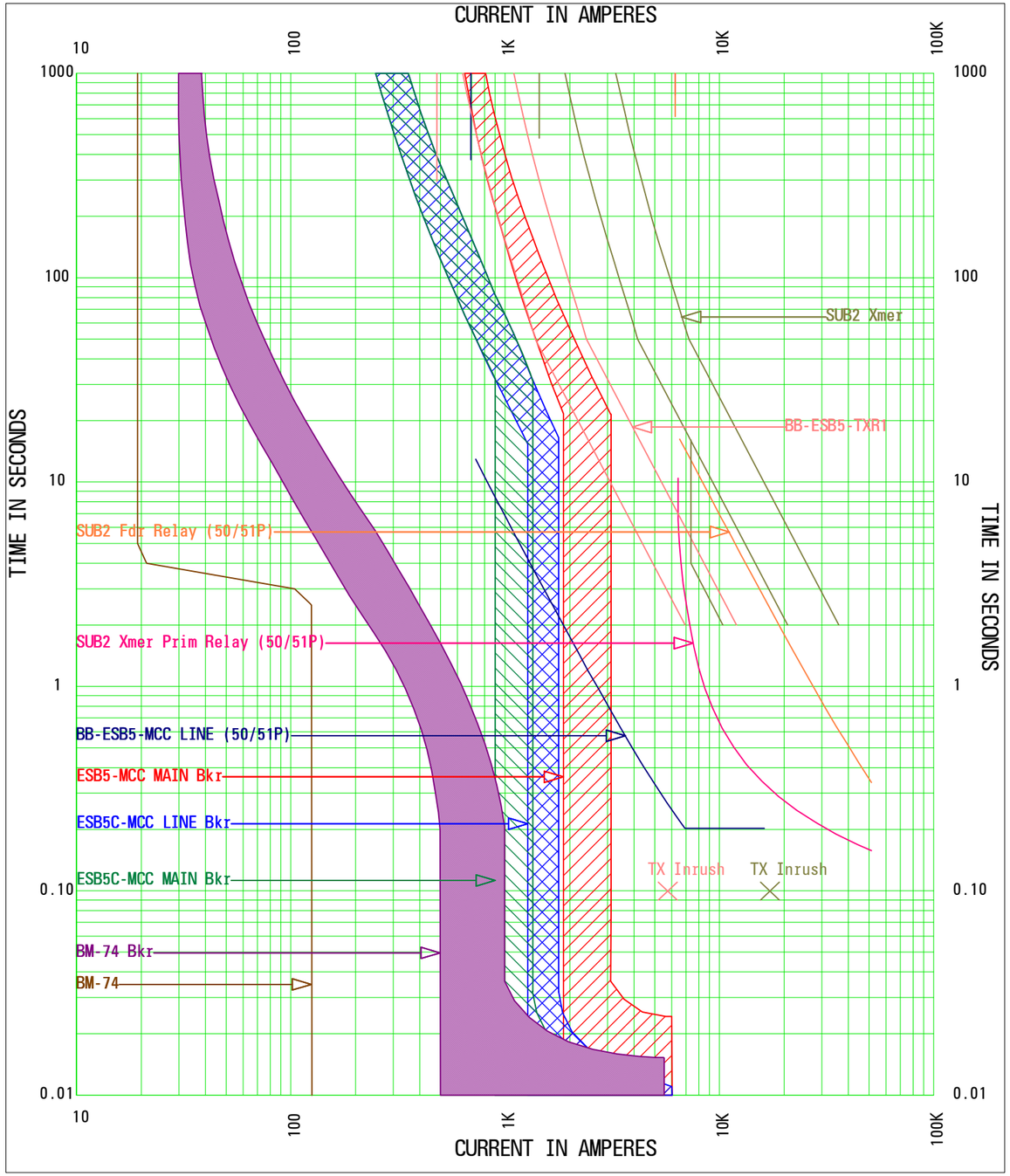
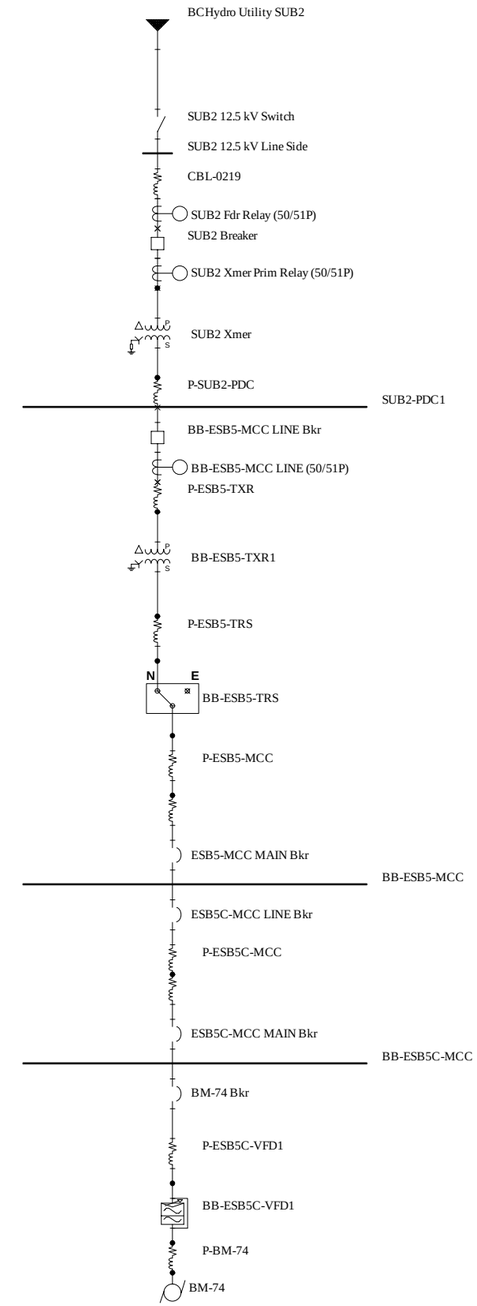

```
Device Name:     SUB2 Xmer Prim Relay (50/51P)          TCC Name:         Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       2474.1A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1            1 (300A)              Test Points: @2.0X, 0.456s
         2) IEEE Mod Inv          0.12                             @5.0X, 0.203s
                                                                   @10.0X, 0.145s

-------------------------------------------------------------------------------------------
Device Name:     BB-ESB4-TXR1                           TCC Name:         Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB4-TXR1 Prim Side                 Bus Voltage:      4160.0V / 600V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      4160 LL/600 LL
Nominal kVA:     100.0kVA                               Pri Connection:   Delta
Full Load kVA:   100.0kVA                               Sec Connection:   Wye-Ground
Impedance (%Z):  5.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     BB-ESB4-MCC LINE (50/51P)              TCC Name:         Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Bus Name:        SUB2-PDC1                              Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2337.7A
Current Rating:  100A / 1A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                   1 (100A)              Test Points: @2.0X, 1.147s
         2) IEEE, Ext. Inverse    0.16                             @5.0X, 0.200s
                                                                   @10.0X, 0.065s

-------------------------------------------------------------------------------------------
Device Name:     ESB4-MCC MAIN Bkr                      TCC Name:         Branch #2-BB-ESB4-MCC IN-SVC TCC.tcc
Bus Name:        BB-ESB4-MCC                            Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     100-400A
Type:            HKD
AIC Rating:      35kA                                   Fault Duty:       1879.2A
```

```
Frame:            HKD 600V 225A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Trip:             225A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     5 (1125A)
```





Branch #3-BB-ESB5C-MCC IN-SVC TCC
Current Scale: x 1
Reference Voltage: 600

```
 Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
 TCC Name:          Branch #3-BB-ESB5C-MCC IN-SVC TCC.tcc
 Reference Voltage: 600 V
 Current Scale:     X 10^0
 TCC Notes:
 TCC Comment:
 Fault Duty Option: Study Result - Bus Fault Current


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 ---------------------------------------------------------------------------------------
 Device Name:     SUB2 Fdr Relay (50/51P)                   TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        SUB2 Xmer Prim Side                       Bus Voltage:      12470.0V
 Function Name:   Phase
 Manufacturer:    GE MULTILIN
 Description:     50/51P
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       2474.1A
 Current Rating:  300A / 5A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 51P                   1 (300A)                 Test Points: @2.0X, 4.518s
          2) IEEE, Ext. Inverse    0.63                                  @5.0X, 0.787s
                                                                         @10.0X, 0.254s

 ---------------------------------------------------------------------------------------
 Device Name:     SUB2 Xmer                                 TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        SUB2 Xmer Prim Side                       Bus Voltage:      12470.0V / 4160V
                                                            Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Description:     2-Winding Transformer Damage Curve        Rated Volts:      12470 LL/4160 LL
 Nominal kVA:     1500.0kVA                                 Pri Connection:   Delta
 Full Load kVA:   1500.0kVA                                 Sec Connection:   Wye-Ground
```
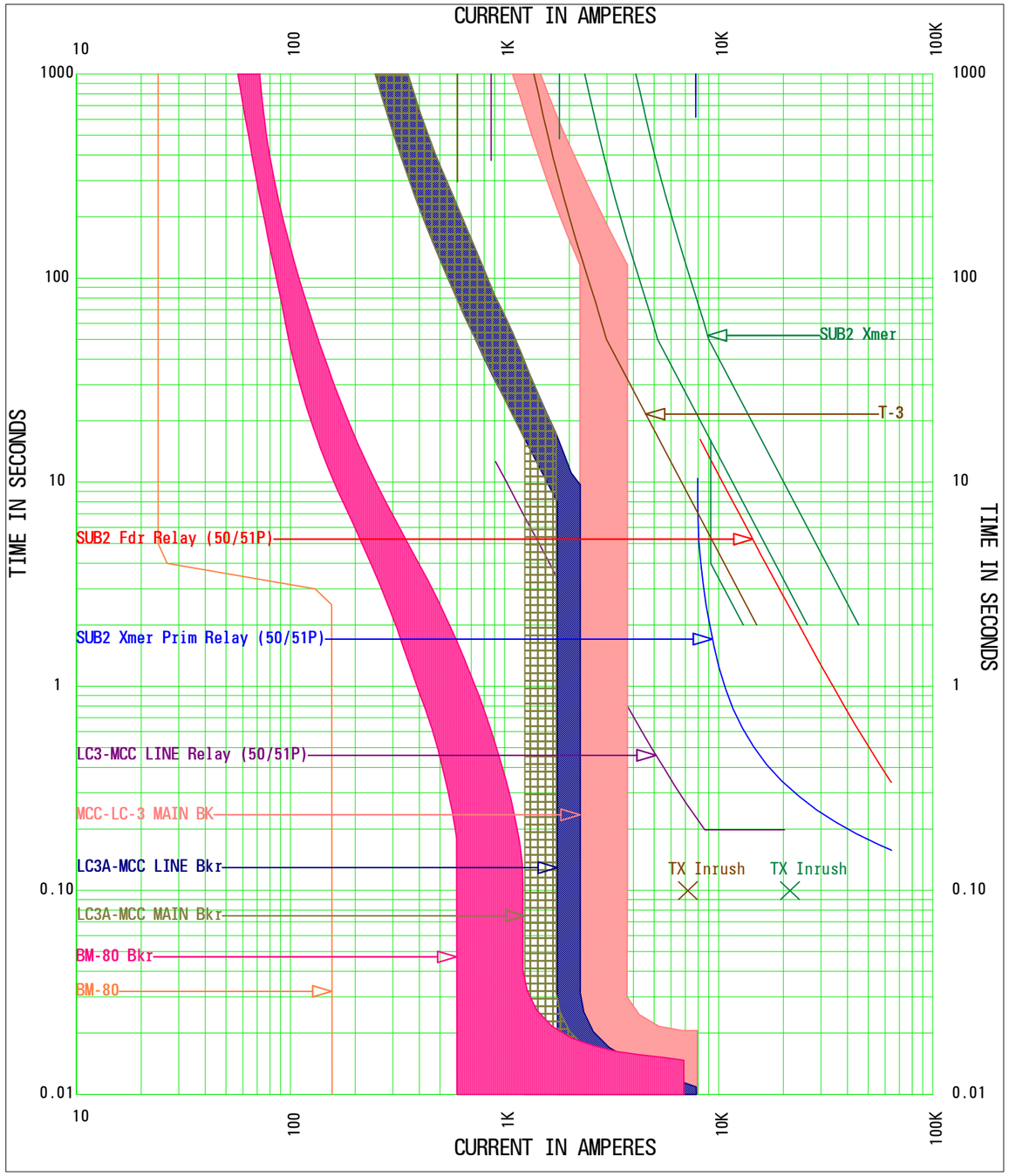
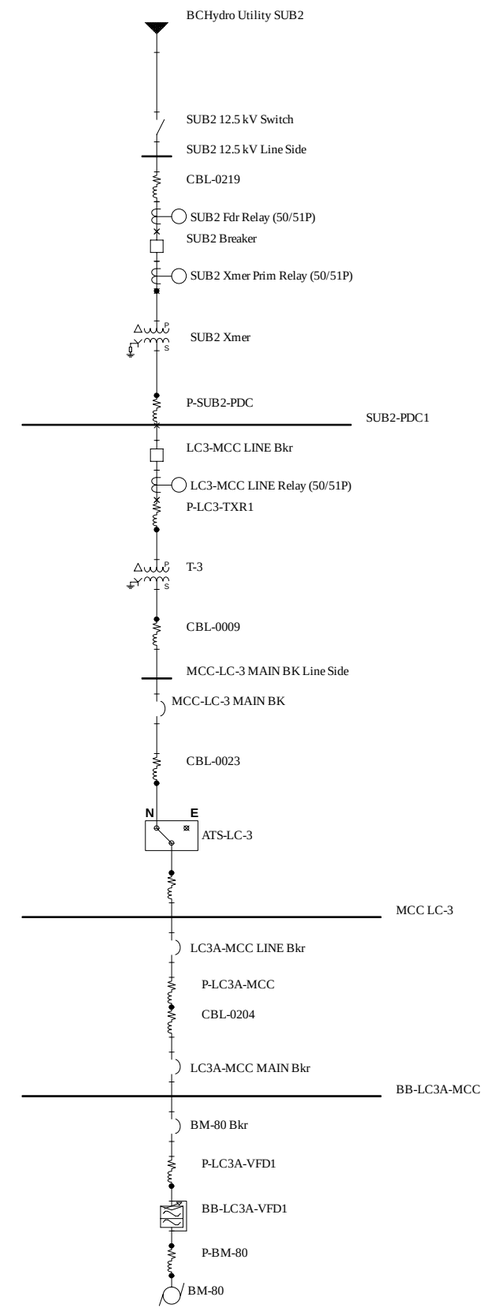

```
 Impedance (%Z):  8.0000                                    Inrush Factor:    12.0x
 ---------------------------------------------------------------------------------------
 Device Name:     SUB2 Xmer Prim Relay (50/51P)             TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        SUB2 Xmer Prim Side                       Bus Voltage:      12470.0V
 Function Name:   Phase
 Manufacturer:    GE MULTILIN
 Description:     50/51P
 Type:            845                                       Class Desc:       845
 AIC Rating:      N/A                                       Fault Duty:       2474.1A
 Current Rating:  300A / 5A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) Phase TOC1            1 (300A)                 Test Points: @2.0X, 0.456s
          2) IEEE Mod Inv          0.12                                  @5.0X, 0.203s
                                                                         @10.0X, 0.145s

 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB5-TXR1                              TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        BB-ESB5-TXR1 Prim Side                    Bus Voltage:      4160.0V / 600V
                                                            Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Description:     2-Winding Transformer Damage Curve        Rated Volts:      4160 LL/600 LL
 Nominal kVA:     500.0kVA                                  Pri Connection:   Delta
 Full Load kVA:   500.0kVA                                  Sec Connection:   Wye-Ground
 Impedance (%Z):  5.0000                                    Inrush Factor:    12.0x
 ---------------------------------------------------------------------------------------
 Device Name:     BB-ESB5-MCC LINE (50/51P)                 TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Phase
 Manufacturer:    GE MULTILIN
 Description:     50/51P
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       2337.7A
 Current Rating:  100A / 1A                                 Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 51P                   1 (100A)                 Test Points: @2.0X, 3.586s
          2) IEEE, Ext. Inverse    0.5                                   @5.0X, 0.625s
                                                                         @10.0X, 0.202s

 ---------------------------------------------------------------------------------------
 Device Name:     ESB5-MCC MAIN Bkr                         TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
```

```
 Bus Name:        BB-ESB5-MCC                                Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     70-600A
 Type:            HLA
 AIC Rating:      25kA                                       Fault Duty:       6030.5A
 Frame:           HLA 600V 600A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
 Trip:            500A
 Setting: 1) Thermal Curve (Fixed
          2) INST (5-10 x Trip)     5 (2500A)

 ----------------------------------------------------------------------------------------
 Device Name:     ESB5C-MCC LINE Bkr                         TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        BB-ESB5-MCC                                Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     100-400A
 Type:            HKD
 AIC Rating:      35kA                                       Fault Duty:       6030.5A
 Frame:           HKD 600V 225A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
 Trip:            225A
 Setting: 1) Thermal Curve (Fixed
          2) INST (5-10 x Trip)     6.78 (1525.5A)

 ----------------------------------------------------------------------------------------
 Device Name:     BM-74 Bkr                                  TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
 Bus Name:        BB-ESB5C-MCC                               Bus Voltage:      600.0V
 Function Name:   Phase
 Manufacturer:    CUTLER-HAMMER
 Description:     15-225A
 Type:            FDC
 AIC Rating:      35kA                                       Fault Duty:       5536.8A
 Frame:           FDC 600V 30A                               Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                      Tcc Time Adder:       0
 Trip:            30A
 Setting: 1) Fixed

 ----------------------------------------------------------------------------------------
 Device Name:     ESB5C-MCC MAIN Bkr                         TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
```

```
Bus Name:        BB-ESB5C-MCC                                Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     100-400A
Type:            HKD
AIC Rating:      35kA                                        Fault Duty:       5536.8A
Frame:           HKD 600V 225A                               Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Trip:            225A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     5 (1125A)

-------------------------------------------------------------------------------------------
Device Name:     BM-74                                       TCC Name:         Branch #3-BB-ESB5C-MCC IN-SVC
TCC.tcc
Bus Name:        BUS-0133                                    Bus Voltage:      600.0V
                                                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Description:     Motor Starting Curve                        Inrush:           6.5 (125.4A)
Rated Size:      20HP      (1 of 1 Plotted)                  FLA+Load Adder:   19.3A + 0.0A
Power Factor:    0.8                                         Starting Time:    5.00s
Efficiency:      0.93                                        Full Voltage (Square Transient)
```





Branch #4-BB-LC3A-MCC IN-SVC TCC
Current Scale: x 1
Reference Voltage: 480

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Reference Voltage: 480 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     SUB2 Fdr Relay (50/51P)                  TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                      Class Desc:       GE-850
AIC Rating:      N/A                                      Fault Duty:       2474.1A
Current Rating:  300A / 5A                                Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Setting: 1) 51P                    1 (300A)               Test Points: @2.0X, 4.518s
         2) IEEE, Ext. Inverse     0.63                                @5.0X, 0.787s
                                                                       @10.0X, 0.254s

-------------------------------------------------------------------------------------------
Device Name:     SUB2 Xmer                                TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V / 4160V
                                                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve       Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                                Pri Connection:   Delta
Full Load kVA:   1500.0kVA                                Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                   Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
```
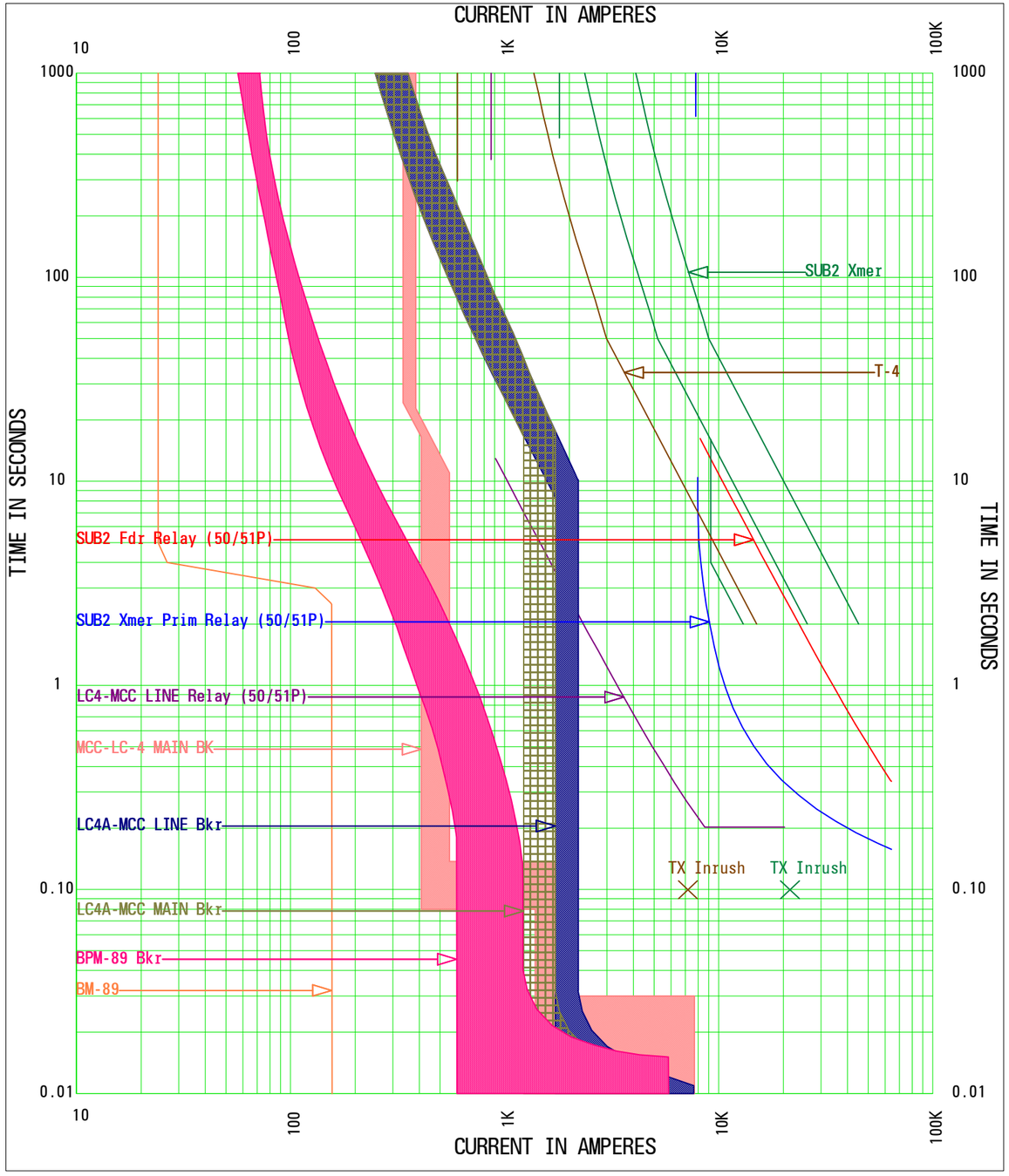
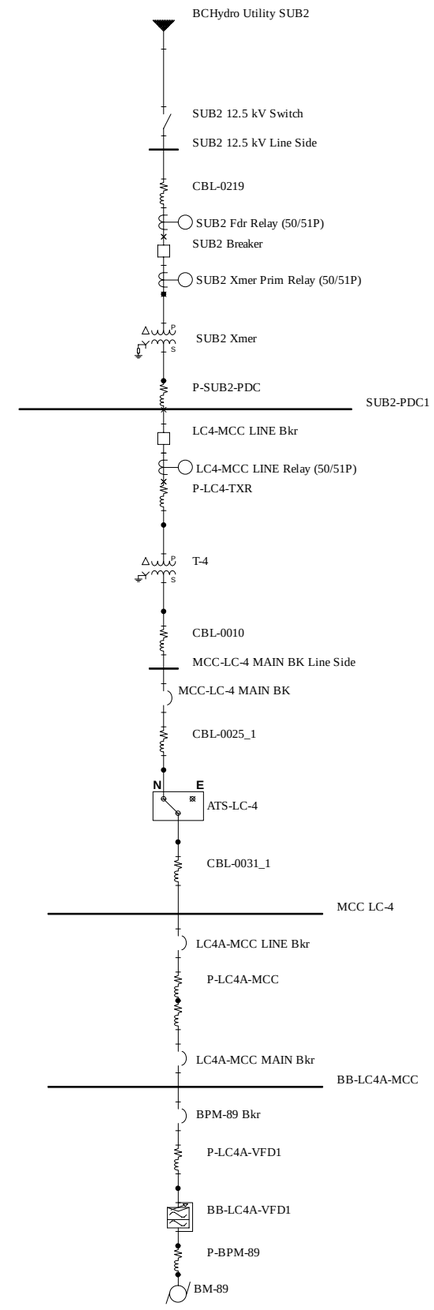

```
Device Name:     SUB2 Xmer Prim Relay (50/51P)          TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       2474.1A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1            1 (300A)              Test Points: @2.0X, 0.456s
         2) IEEE Mod Inv          0.12                             @5.0X, 0.203s
                                                                   @10.0X, 0.145s

-------------------------------------------------------------------------------------------
Device Name:     LC3-MCC LINE Relay (50/51P)            TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2-PDC1                              Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2337.7A
Current Rating:  100A / 1A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                   1 (100A)              Test Points: @2.0X, 3.514s
         2) IEEE, Ext. Inverse    0.49                             @5.0X, 0.612s
                                                                   @10.0X, 0.198s

-------------------------------------------------------------------------------------------
Device Name:     T-3                                    TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:        T-3 Prim Side                          Bus Voltage:      4160.0V / 480V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      4160 LL/480 LL
Nominal kVA:     500.0kVA                               Pri Connection:   Delta
Full Load kVA:   500.0kVA                               Sec Connection:   Wye-Ground
Impedance (%Z):  4.8000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     BM-80 Bkr                              TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:        BB-LC3A-MCC                            Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FD
AIC Rating:      35kA                                   Fault Duty:       6858.8A
```

```
Frame:            FD 480V 50A                                Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Trip:             50A
Setting: 1) Fixed

-----------------------------------------------------------------------------------------
Device Name:      LC3A-MCC MAIN Bkr                          TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:         BB-LC3A-MCC                                Bus Voltage:      480.0V
Function Name:    Phase
Manufacturer:     CUTLER-HAMMER
Description:      100-400A
Type:             HKD
AIC Rating:       65kA                                       Fault Duty:       6858.8A
Frame:            HKD 480V 225A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Trip:             225A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     6.64 (1494A)

-----------------------------------------------------------------------------------------
Device Name:      BM-80                                      TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:         BUS-0076                                   Bus Voltage:      480.0V
                                                             Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Description:      Motor Starting Curve                       Inrush:           6.5 (156.8A)
Rated Size:       20HP      (1 of 1 Plotted)                 FLA+Load Adder:   24.1A + 0.0A
Power Factor:     0.8                                        Starting Time:    5.00s
Efficiency:       0.93                                       Full Voltage (Square Transient)
-----------------------------------------------------------------------------------------
Device Name:      LC3A-MCC LINE Bkr                          TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
Bus Name:         MCC LC-3                                   Bus Voltage:      480.0V
Function Name:    Phase
Manufacturer:     CUTLER-HAMMER
Description:      100-400A
Type:             HKD
AIC Rating:       65kA                                       Fault Duty:       7860.0A
Frame:            HKD 480V 225A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                       Tcc Time Adder:       0
Trip:             225A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     8.93 (2009.3A)

-----------------------------------------------------------------------------------------
Device Name:      MCC-LC-3 MAIN BK                           TCC Name:         Branch #4-BB-LC3A-MCC IN-SVC TCC.tcc
```

```
Bus Name:        MCC-LC-3 MAIN BK Line Side                Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     125-800A
Type:            MA
AIC Rating:      30kA                                      Fault Duty:       7938.7A
Frame:           MA 480V 800A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Trip:            800A
Setting: 1) Thermal Curve (Fixed
         2) INST (3000-6000A)      3000 (3000A)
```





Branch #5-BB-LC4A-MCC IN-SVC TCC
Current Scale: x 1
Reference Voltage: 480

```
Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
TCC Name:          Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Reference Voltage: 480 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


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-------------------------------------------------------------------------------------------
Device Name:     SUB2 Fdr Relay (50/51P)                  TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                      Class Desc:       GE-850
AIC Rating:      N/A                                      Fault Duty:       2474.1A
Current Rating:  300A / 5A                                Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Setting: 1) 51P                    1 (300A)               Test Points: @2.0X, 4.518s
         2) IEEE, Ext. Inverse     0.63                                @5.0X, 0.787s
                                                                       @10.0X, 0.254s

-------------------------------------------------------------------------------------------
Device Name:     SUB2 Xmer                                TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V / 4160V
                                                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve       Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                                Pri Connection:   Delta
Full Load kVA:   1500.0kVA                                Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                   Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
```
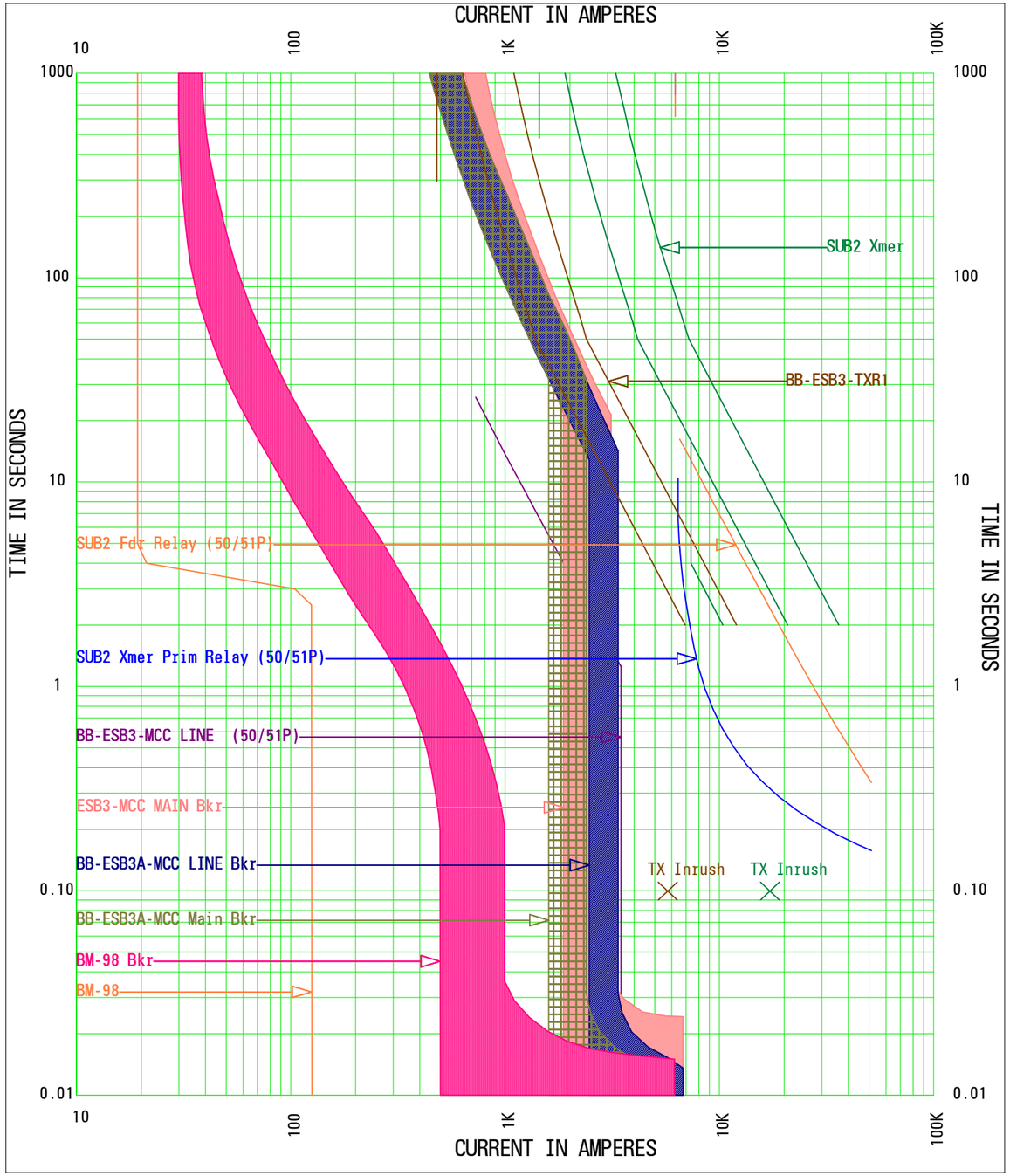
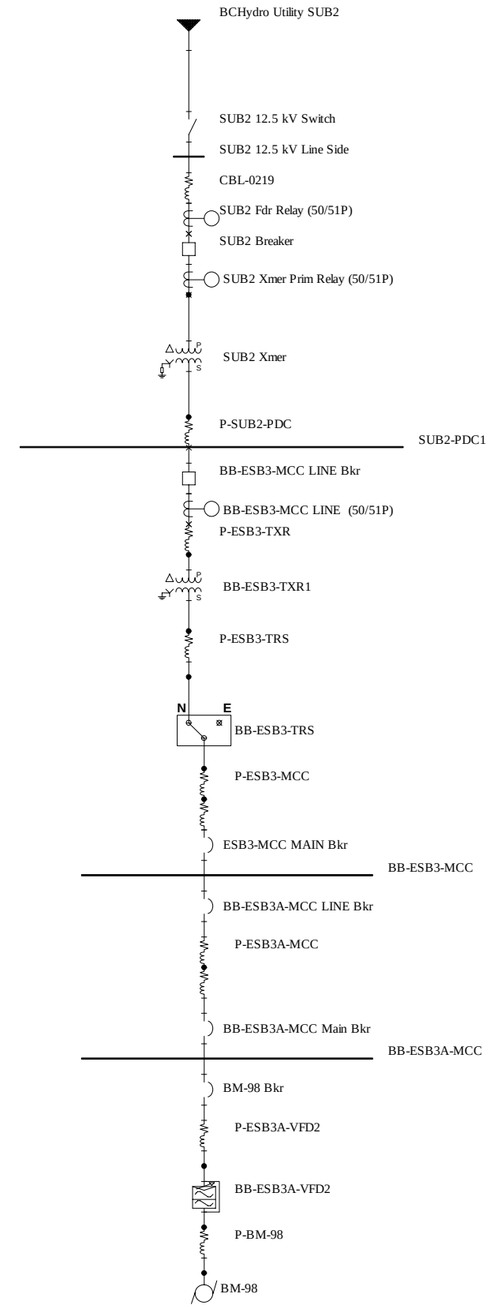

```
Device Name:     SUB2 Xmer Prim Relay (50/51P)          TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       2474.1A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1            1 (300A)              Test Points: @2.0X, 0.456s
         2) IEEE Mod Inv          0.12                             @5.0X, 0.203s
                                                                   @10.0X, 0.145s

-----------------------------------------------------------------------------------------
Device Name:     LC4-MCC LINE Relay (50/51P)            TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        SUB2-PDC1                              Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2337.7A
Current Rating:  100A / 1A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                   1 (100A)              Test Points: @2.0X, 3.586s
         2) IEEE, Ext. Inverse    0.5                              @5.0X, 0.625s
                                                                   @10.0X, 0.202s

-----------------------------------------------------------------------------------------
Device Name:     T-4                                    TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        T-4 Prim Side                          Bus Voltage:      4160.0V / 480V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      4160 LL/480 LL
Nominal kVA:     500.0kVA                               Pri Connection:   Delta
Full Load kVA:   500.0kVA                               Sec Connection:   Wye-Ground
Impedance (%Z):  5.0000                                 Inrush Factor:    12.0x
-----------------------------------------------------------------------------------------
Device Name:     BPM-89 Bkr                             TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        BB-LC4A-MCC                            Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FD
AIC Rating:      35kA                                   Fault Duty:       5844.4A
```

```
Frame:           FD 480V 50A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                Tcc Time Adder:       0
Trip:            50A
Setting: 1) Fixed

-----------------------------------------------------------------------------------------
Device Name:     LC4A-MCC MAIN Bkr                    TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        BB-LC4A-MCC                          Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     100-400A
Type:            HKD
AIC Rating:      65kA                                 Fault Duty:       5844.4A
Frame:           HKD 480V 225A                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                Tcc Time Adder:       0
Trip:            225A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     6.57 (1478.3A)

-----------------------------------------------------------------------------------------
Device Name:     BM-89                                TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        BUS-0111                             Bus Voltage:      480.0V
                                                      Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                Tcc Time Adder:       0
Description:     Motor Starting Curve                 Inrush:           6.5 (156.8A)
Rated Size:      20HP      (1 of 1 Plotted)           FLA+Load Adder:   24.1A + 0.0A
Power Factor:    0.8                                  Starting Time:    5.00s
Efficiency:      0.93                                 Full Voltage (Square Transient)
-----------------------------------------------------------------------------------------
Device Name:     LC4A-MCC LINE Bkr                    TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
Bus Name:        MCC LC-4                             Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     100-400A
Type:            HKD
AIC Rating:      65kA                                 Fault Duty:       7630.8A
Frame:           HKD 480V 225A                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                Tcc Time Adder:       0
Trip:            225A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     8.75 (1968.8A)

-----------------------------------------------------------------------------------------
Device Name:     MCC-LC-4 MAIN BK                     TCC Name:         Branch #5-BB-LC4A-MCC IN-SVC TCC.tcc
```

```
Bus Name:        MCC-LC-4 MAIN BK Line Side                Bus Voltage:      480.0V
Function Name:   Phase
Manufacturer:    MERLIN GERIN
Description:     LSI, 250-800A Sensors
Type:            Masterpact, STR 58U
AIC Rating:      65kA ShortTime:50                         Fault Duty:       7704.9A
Frame:           MC08H1 480V 800A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
Sensor:          800A
Plug:            800A
Setting: 1) LTPU (lo x lr x S)     0.5; 0.8 (320A)
         2) LTD (15-480 Sec.)      15
         3) STPU (1.5-10 x LTPU)   1.5 (480A)
         4) STD (INST-0.4)         0.1         I^2 t Out
         5) INST (2-28 x S)        2 (1600A)
```





Branch #6-BB-ESB3A-MCC MAINT TCC
Current Scale: x 1
Reference Voltage: 600

```
Project Name:      Burnaby Terminal(AF Maintenance Mode -1 jet fue)
TCC Name:          Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Reference Voltage: 600 V
Current Scale:     X 10^0
TCC Notes:
TCC Comment:
Fault Duty Option: Study Result - Bus Fault Current


-------------------------------------------------------------------------------------
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-------------------------------------------------------------------------------------
Device Name:     SUB2 Fdr Relay (50/51P)                  TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                      Class Desc:       GE-850
AIC Rating:      N/A                                      Fault Duty:       2474.1A
Current Rating:  300A / 5A                                Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Setting: 1) 51P                    1 (300A)               Test Points: @2.0X, 4.518s
         2) IEEE, Ext. Inverse     0.63                                @5.0X, 0.787s
                                                                       @10.0X, 0.254s

-------------------------------------------------------------------------------------
Device Name:     SUB2 Xmer                                TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                      Bus Voltage:      12470.0V / 4160V
                                                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                    Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve       Rated Volts:      12470 LL/4160 LL
Nominal kVA:     1500.0kVA                                Pri Connection:   Delta
Full Load kVA:   1500.0kVA                                Sec Connection:   Wye-Ground
Impedance (%Z):  8.0000                                   Inrush Factor:    12.0x
-------------------------------------------------------------------------------------
```
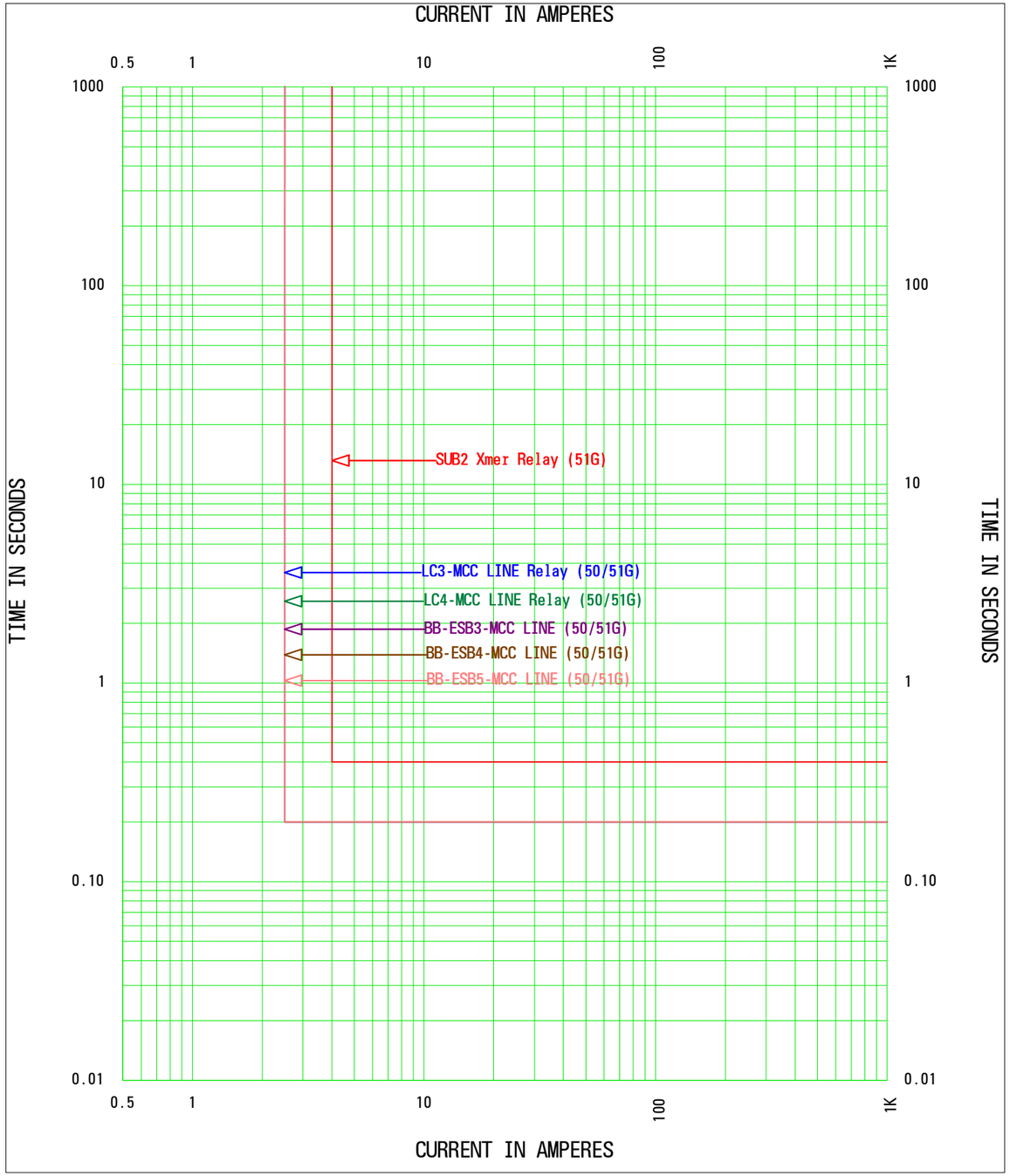
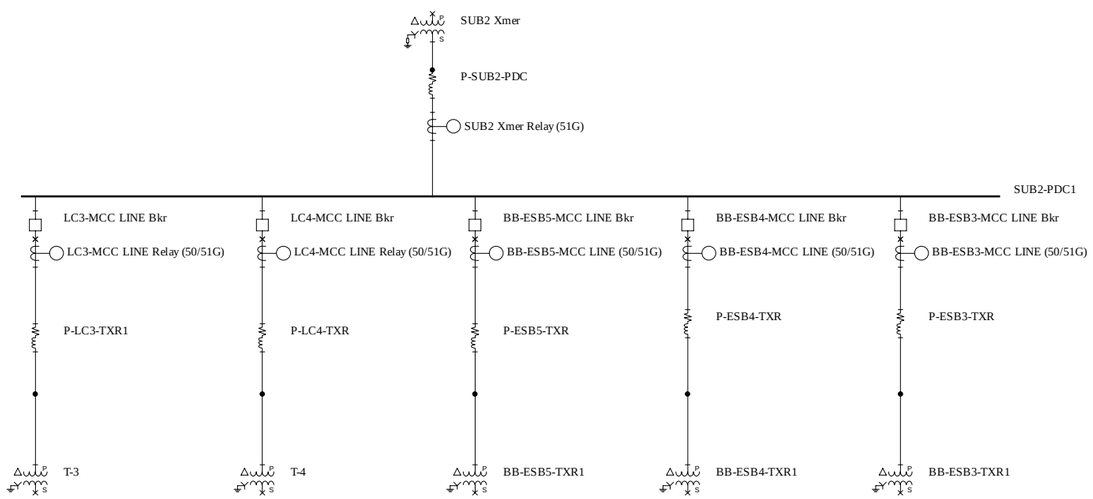

```
Device Name:     SUB2 Xmer Prim Relay (50/51P)          TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        SUB2 Xmer Prim Side                    Bus Voltage:      12470.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            845                                    Class Desc:       845
AIC Rating:      N/A                                    Fault Duty:       2474.1A
Current Rating:  300A / 5A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) Phase TOC1            1 (300A)              Test Points: @2.0X, 0.456s
         2) IEEE Mod Inv          0.12                             @5.0X, 0.203s
         3) Mod Inverse           1; 1                             @10.0X, 0.145s

-------------------------------------------------------------------------------------------
Device Name:     BB-ESB3-TXR1                           TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        BB-ESB3-TXR1 Prim Side                 Bus Voltage:      4160.0V / 600V
                                                        Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Description:     2-Winding Transformer Damage Curve     Rated Volts:      4160 LL/600 LL
Nominal kVA:     500.0kVA                               Pri Connection:   Delta
Full Load kVA:   500.0kVA                               Sec Connection:   Wye-Ground
Impedance (%Z):  5.0000                                 Inrush Factor:    12.0x
-------------------------------------------------------------------------------------------
Device Name:     BB-ESB3-MCC LINE  (50/51P)             TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        SUB2-PDC1                              Bus Voltage:      4160.0V
Function Name:   Phase
Manufacturer:    GE MULTILIN
Description:     50/51P
Type:            850                                    Class Desc:       GE-850
AIC Rating:      N/A                                    Fault Duty:       2337.7A
Current Rating:  100A / 1A                              Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Setting: 1) 51P                   1 (100A)              Test Points: @2.0X, 7.243s
         2) IEEE, Ext. Inverse    1.01                             @5.0X, 1.262s
         3) 50P                   5 (500A)                         @10.0X, 0.408s

-------------------------------------------------------------------------------------------
Device Name:     BB-ESB3A-MCC LINE Bkr                  TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        BB-ESB3-MCC                            Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     100-400A
Type:            HKD
AIC Rating:      35kA                                   Fault Duty:       6778.6A
```

```
Frame:           HKD 600V 400A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Trip:            400A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     7.31 (2924A)

-------------------------------------------------------------------------------------
Device Name:     ESB3-MCC MAIN Bkr                      TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        BB-ESB3-MCC                            Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     70-600A
Type:            HLA
AIC Rating:      25kA                                   Fault Duty:       6778.6A
Frame:           HLA 600V 600A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Trip:            500A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     5 (2500A)

-------------------------------------------------------------------------------------
Device Name:     BB-ESB3A-MCC Main Bkr                  TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        BB-ESB3A-MCC                           Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     100-400A
Type:            HKD
AIC Rating:      35kA                                   Fault Duty:       6187.3A
Frame:           HKD 600V 400A                          Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
Trip:            400A
Setting: 1) Thermal Curve (Fixed
         2) INST (5-10 x Trip)     5 (2000A)

-------------------------------------------------------------------------------------
Device Name:     BM-98 Bkr                              TCC Name:         Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:        BB-ESB3A-MCC                           Bus Voltage:      600.0V
Function Name:   Phase
Manufacturer:    CUTLER-HAMMER
Description:     15-225A
Type:            FDC
AIC Rating:      35kA                                   Fault Duty:       6187.3A
Frame:           FDC 600V 30A                           Tcc Current Multiplier: 1
Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
```

Trip: 30A
Setting: 1) Fixed

Device Name:	BM-98	TCC Name:	Branch #6-BB-ESB3A-MCC MAINT TCC.tcc
Bus Name:	BUS-0119	Bus Voltage:	600.0V
		Tcc Current Multiplier:	1
Tcc Time Multiplier:	1	Tcc Time Adder:	0
Description:	Motor Starting Curve	Inrush:	6.5 (125.4A)
Rated Size:	20HP (1 of 1 Plotted)	FLA+Load Adder:	19.3A + 0.0A
Power Factor:	0.8	Starting Time:	5.00s
Efficiency:	0.93	Full Voltage (Square Transient)	





Branch #7-AUBREY GROUND FAULT TCC
Current Scale: x 1
Reference Voltage: 4160

```
 Project Name:      Burnaby Terminal(AF In Service Mode-1 jet fuel )
 TCC Name:          Branch #7-AUBREY GROUND FAULT TCC.tcc
 Reference Voltage: 4160 V
 Current Scale:     X 10^0
 TCC Notes:
 TCC Comment:
 Fault Duty Option: Study Result - Bus Fault Current


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 ------------------------------------------------------------------------------------------
 Device Name:     BB-ESB3-MCC LINE (50/51G)                 TCC Name:         Branch #7-AUBREY GROUND FAULT
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       15.0A
 Current Rating:  50A / 5A                                  Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 50G                    0.05 (2.5A)             Test Points: @2.0X, 0.200s
          2) Definite Time          0.2 (seconds)                        @5.0X, 0.200s
                                                                         @10.0X, 0.200s

 ------------------------------------------------------------------------------------------
 Device Name:     BB-ESB4-MCC LINE (50/51G)                 TCC Name:         Branch #7-AUBREY GROUND FAULT
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       15.0A
```

```
 Current Rating:  50A / 5A                                  Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 50G                    0.05 (2.5A)             Test Points: @2.0X, 0.200s
          2) Definite Time          0.2 (seconds)                        @5.0X, 0.200s
                                                                         @10.0X, 0.200s

 ----------------------------------------------------------------------------------------
 Device Name:     BB-ESB5-MCC LINE (50/51G)                 TCC Name:         Branch #7-AUBREY GROUND FAULT
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       15.0A
 Current Rating:  50A / 5A                                  Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 50G                    0.05 (2.5A)             Test Points: @2.0X, 0.200s
          2) Definite Time          0.2 (seconds)                        @5.0X, 0.200s
                                                                         @10.0X, 0.200s

 ----------------------------------------------------------------------------------------
 Device Name:     LC3-MCC LINE Relay (50/51G)               TCC Name:         Branch #7-AUBREY GROUND FAULT
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                       Class Desc:       GE-850
 AIC Rating:      N/A                                       Fault Duty:       15.0A
 Current Rating:  50A / 5A                                  Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                     Tcc Time Adder:       0
 Setting: 1) 50G                    0.05 (2.5A)             Test Points: @2.0X, 0.200s
          2) Definite Time          0.2 (seconds)                        @5.0X, 0.200s
                                                                         @10.0X, 0.200s

 ----------------------------------------------------------------------------------------
 Device Name:     LC4-MCC LINE Relay (50/51G)               TCC Name:         Branch #7-AUBREY GROUND FAULT
TCC.tcc
 Bus Name:        SUB2-PDC1                                 Bus Voltage:      4160.0V
 Function Name:   Neutral
 Manufacturer:    GE MULTILIN
 Description:     50/51G
 Type:            850                                       Class Desc:       GE-850
```

```
 AIC Rating:      N/A                                    Fault Duty:       15.0A
 Current Rating:  50A / 5A                               Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
 Setting: 1) 50G                  0.05 (2.5A)            Test Points: @2.0X, 0.200s
          2) Definite Time        0.2 (seconds)                       @5.0X, 0.200s
                                                                      @10.0X, 0.200s

 ---------------------------------------------------------------------------------------------
 Device Name:     SUB2 Xmer Relay (51G)                  TCC Name:         Branch #7-AUBREY GROUND FAULT
TCC.tcc
 Bus Name:        SUB2-PDC1                              Bus Voltage:      4160.0V
 Function Name:   Neutral
 Manufacturer:    STARTCO
 Description:     50/ 51G/ 51N, CT200
 Type:            SE-325                                 Class Desc:       SE-325
 AIC Rating:      N/A                                    Fault Duty:       15.0A
 Current Rating:  200A / 5A                              Tcc Current Multiplier: 1
 Tcc Time Multiplier: 1                                  Tcc Time Adder:       0
 Setting: 1) GF Trip Level        4 (4A)                 Test Points: @2.0X, 0.400s
          2) GF Trip Time         0.4 (seconds)                       @5.0X, 0.401s
                                                                      @10.0X, 0.401s
```

Appendix 3

Alternate Scenario – Emergency Generator

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Table 1E - Low Voltage MCC Bus Rating

Bus	Lineup Bus Bracing (kA)	Fault Duty (kA)	% Capacity Utilized [%]	Notes
BB-ESB1-MCC	42	2.6	6	
BB-ESB2-MCC	42	1.7	4	
BB-ESB2A-MCC	42	1.7	4	
MCC-EX	42	1.2	3	
MCC-AX	42	2.2	5	
DIV. OFFICE BASMENT	42	1.2	3	
LEVEE BUILDING	42	0.8	2	
CDP PANEL AX (CTRL RM BLDG)	42	1.9	5	
CDP PANEL BX	42	2.1	5	
PDP#1	42	2.1	5	
PDP#3	42	2.1	5	
PDP#4	42	2.1	5	
PDP#5	42	2.1	5	
PDP#6	42	2.1	5	
MCC-DX	42	2.1	5	
MCC LC-3	42	1.6	4	
BB-LC3A-MCC	42	1.6	4	
TK90/88 MCC	42	1.5	4	
TK82 MCC	42	1.3	3	
TK86 MCC	42	1.4	3	
TK72 MCC	42	1.3	3	
TK74 MCC	42	1.2	3	
MCC LC-4	42	1.6	4	
BB-LC4A-MCC	42	1.6	4	
TK71 MCC	42	1.3	3	
TK73 MCC	42	1.2	3	
TK81 MCC	42	1.3	3	
TK83 MCC	42	1.4	3	
TK85 MCC	42	1.6	4	
TK87 MCC	42	1.3	3	
BB-ESB3-MCC	42	0.9	2	
BB-ESB3A-MCC	42	0.9	2	
BB-ESB3B-MCC	42	0.9	2	
BB-ESB4-MCC	42	0.4	1	
BB-ESB5-MCC	42	0.9	2	
BB-ESB5A-MCC	42	0.9	2	
BB-ESB5B-MCC	42	0.9	2	
BB-ESB5C-MCC	42	0.9	2	

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Table 1F - Low Voltage Breaker & Fuse Rating

Device	Interrupting Rating (kA)	Low Voltage Fault Duty (kA)	% Capacity Utilized [%]
BB-ESB1-GEN Bkr	25	3	12
BB-ESB2-GEN Bkr	25	2	8
BB-ESB3-GEN Bkr	25	1	4
BB-ESB3A-MCC LINE Bkr	35	1	3
BB-ESB3A-MCC Main Bkr	35	1	3
BB-ESB3B-MCC LINE Bkr	35	1	3
BB-ESB3B-MCC Main Bkr	35	1	3
BB-ESB4-GEN Bkr	25	0.5	2
BB-ESB5-GEN Bkr	25	1.1	4
BM-74 Bkr	35	1.1	3
BM-75 Bkr	35	1.1	3
BM-76 Bkr	35	1.1	3
BM-77 Bkr	35	1.1	3
BM-78 Bkr	35	1.1	3
BM-79 Bkr	35	1.1	3
BM-80 Bkr	35	2.2	6
BM-91 Bkr	35	1	3
BM-93 Bkr	35	1	3
BM-96 Bkr	35	1	3
BM-97 Bkr	35	1	3
BM-98 Bkr	35	1	3
BPM-11 Bkr	35	2.9	8
BPM-12 Bkr	35	1.9	5
BPM-21 Bkr	35	2.9	8
BPM-22 Bkr	35	1.9	5
BPM-31 Bkr	35	2.9	8
BPM-31 Bkr1	35	2.2	6
BPM-32 Bkr	35	1.9	5
CDP-AX FDR BK	65	2.5	4
CDP-BX FDR BK	65	2.5	4
DIV OFFICE FDR BK	65	2.5	4
ESB1-AHU Bkr	25	2.9	12
ESB1-LP1 Bkr	25	2.9	12
ESB1-MCC MAIN Bkr	65	2.8	4
ESB2-AHU Bkr	25	1.9	8
ESB2-LP1 Bkr	25	1.9	8
ESB2-MCC MAIN Bkr	65	1.8	3
ESB2A-LP1 Bkr	25	1.8	7
ESB2A-MCC LINE Bkr	25	1.9	8
ESB2A-MCC MAIN Bkr	25	1.8	7

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Table 1F - Low Voltage Breaker & Fuse Rating (Cont.)

Device	Interrupting Rating (kA)	Low Voltage Fault Duty (kA)	% Capacity Utilized [%]
ESB3-LP1 Bkr	25	1	4
ESB3-MCC MAIN Bkr	25	1	4
ESB3A-LP1 Bkr	25	1	4
ESB3B Bkr	35	1	3
ESB3B-LP1 Bkr	25	1	4
ESB4-LP1 Bkr	25	0.5	2
ESB4-MCC MAIN Bkr	35	0.5	1
ESB5-LP1 Bkr	25	1.1	4
ESB5-MCC MAIN Bkr	25	1.1	4
ESB5A-LP1 Bkr	25	1.1	4
ESB5A-MCC LINE Bkr	35	1.1	3
ESB5A-MCC MAIN Bkr	35	1.1	3
ESB5B-LP1 Bkr	25	1.1	4
ESB5B-MCC LINE Bkr	35	1.1	3
ESB5B-MCC MAIN Bkr	35	1.1	3
ESB5C-LP1 Bkr	25	1.1	4
ESB5C-MCC LINE Bkr	35	1.1	3
ESB5C-MCC MAIN Bkr	35	1.1	3
G-LC-3 BK	14	2.9	21
G-LC-4 BK	14	2.9	21
GEN BK	65	2.6	4
LC 71 FDR BK	14	2.8	20
LC 72 FDR BK	14	2.8	20
LC 73 FDR BK	65	2.5	4
LC 74 FDR BK	35	2.5	7
LC 81 FDR BK	14	2.8	20
LC 82 FDR BK	14	2.8	20
LC 83 FDR BK	14	2.8	20
LC 84 FDR BK	14	2.8	20
LC 85 FDR BK	14	2.8	20
LC 86 FDR BK	14	2.8	20
LC 87 FDR BK	14	2.8	20
LC 90/88 FDR BK	35	2.5	7
LC3A-LP1 Bkr	25	2.2	9
LC3A-MCC LINE Bkr	65	2.5	4
LC3A-MCC MAIN Bkr	65	2.2	3
LC4A-LP1 Bkr	25	2.2	9
LC4A-MCC LINE Bkr	65	2.5	4
LC4A-MCC MAIN Bkr	65	2.2	3
MCC-DX FDR BK	25	2.3	9
MCC-EX FDR BK	65	2.5	4
MCC-EX MAIN	65	0.6	1

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Table 1F - Low Voltage Breaker & Fuse Rating (Cont.)

Device	Interrupting Rating (kA)	Low Voltage Fault Duty (kA)	% Capacity Utilized [%]
PDP1 FDR BK	25	2.3	9
PDP3/4 FDR BK	25	2.3	9
PDP5 FDR BK	25	2.3	9
PDP6 FDR BK	25	2.3	9
PFC FD BK	14	2.8	20
PFC-LC4 FD BK	14	2.8	20
TK71 MAIN BK	14	1.5	11
TK72 MAIN BK	14	1.5	11
TK73 MAIN BK	65	1.4	2
TK74 MAIN BK	14	1.4	10
TK81 MAIN BK	14	1.5	11
TK82 MAIN BK	14	1.6	11
TK83 MAIN BK	14	1.8	13
TK84 MAIN BK	14	2	14
TK85 MAIN BK	14	2.3	16
TK86 MAIN BK	14	1.8	13
TK87 MAIN BK	65	1.5	2
TK90/88 MAIN BK	65	1.9	3

Table 1F - Load Interrupt/Transfer Switch

Switch	Interrupt Rating (kA)	Duty (kA)	% Capacity Utilized {Interrupting} [%]
ATS-NORM	30	2.2	7
BB-ESB1-TRS	30	2.6	9
BB-ESB2-TRS	30	1.7	6
ATS-LC3	30	1.6	5
ATS-LC4	30	1.6	5
BB-ESB3-TRS	30	0.6	2
BB-ESB4-TRS	30	0.6	2
BB-ESB5-TRS	30	0.6	2

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Arc Flash Results Emergency Generator Mode

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
BB-ESB1-MCC	BB-ESB1-GEN Bkr	0.60	2.61	1.05	0.91	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N5) (*N9)
BB-ESB1-VFD11 Line Side	BPM-11 Bkr	0.60	2.59	2.59	2.27	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N9)
BB-ESB1-VFD12 Line Side	BPM-12 Bkr	0.60	1.66	1.66	1.51	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N9)
BB-ESB1-VFD21 Line Side	BPM-21 Bkr	0.60	2.59	2.59	2.27	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N9)
BB-ESB1-VFD22 Line Side	BPM-22 Bkr	0.60	1.66	1.66	1.51	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N9)
BB-ESB1-VFD31 Line Side	BPM-31 Bkr	0.60	2.59	2.59	2.27	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N9)
BB-ESB1-VFD32 Line Side	BPM-32 Bkr	0.60	1.66	1.66	1.51	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N9)
BB-ESB2A	ESB2A-MCC MAIN Bkr	0.60	1.66	1.66	1.50	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N9)
BB-ESB2-MCC	BB-ESB2-GEN Bkr	0.60	1.67	1.05	0.95	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N5) (*N9)
BB-ESB3A-MCC	BB-ESB3A-MCC Main Bkr	0.60	0.56	0.56	0.56	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB3A-MCC Main Bkr LineSide	BB-ESB3A-MCC LINE Bkr	0.60	0.56	0.56	0.56	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB3B-MCC	BB-ESB3B-MCC Main Bkr	0.60	0.56	0.56	0.56	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB3B-MCC Main Bkr LineSide	BB-ESB3B-MCC LINE Bkr	0.60	0.56	0.56	0.56	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB3-MCC	BB-ESB3-GEN Bkr	0.60	0.56	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N5) (*N9) (*N1)
BB-ESB4-MCC	BB-ESB4-GEN Bkr	0.60	0.58	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N5) (*N9) (*N1)
BB-ESB5A-MCC	ESB5A-MCC MAIN Bkr	0.60	0.59	0.59	0.59	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB5B-MCC	ESB5B-MCC MAIN Bkr	0.60	0.59	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB5C-MCC	ESB5C-MCC MAIN Bkr	0.60	0.59	0.59	0.59	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
BB-ESB5-MCC	BB-ESB5-GEN Bkr	0.60	0.59	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N5) (*N9) (*N1)
ESB1-MCC MAIN Bkr Line side	BB-ESB1-GEN Bkr	0.60	2.61	1.05	0.91	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N9)
ESB2A-MCC MAIN Bkr Line Side	ESB2A-MCC LINE Bkr	0.60	1.66	1.66	1.50	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N9)
ESB2-MCC MAIN Bkr Line side	BB-ESB2-GEN Bkr	0.60	1.67	1.05	0.95	2	0.0000	Yes	PNL	25	1.16	0.45	5.6	(*N9)
ESB3-MCC MAIN Bkr Line Side	BB-ESB3-GEN Bkr	0.60	0.56	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
ESB4-MCC MAIN Bkr Line Side	BB-ESB4-GEN Bkr	0.60	0.58	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
ESB5A-MCC MAIN Bkr Line Side	ESB5A-MCC LINE Bkr	0.60	0.59	0.59	0.59	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)

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Arc Flash Results Emergency Generator Mode

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
ESB5B-MCC MAIN Bkr Line Side	ESB5B-MCC LINE Bkr	0.60	0.59	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
ESB5C-MCC MAIN Bkr Line Side	ESB5C-MCC LINE Bkr	0.60	0.59	0.59	0.59	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
ESB5-MCC MAIN Bkr Line Side	BB-ESB5-GEN Bkr	0.60	0.59	0.35	0.35	2	0.0000	Yes	PNL	25	0.43	0.45	1.1	(*N9) (*N1)
ATS-LC3 (EMERG)	G-LC-3 BK	0.48	1.61	1.43	1.04	2	0.0000	Yes	PNL	25	1.21	0.45	5.9	(*N3) (*N9)
ATS-LC4 (EMERG)	G-LC-4 BK	0.48	1.60	1.43	1.04	2	0.0000	Yes	PNL	25	1.21	0.45	5.9	(*N3) (*N9)
BB-LC3A-MCC	G-LC-3 BK	0.48	1.57	1.40	1.02	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N3) (*N5) (*N9)
BB-LC4A-MCC	G-LC-4 BK	0.48	1.54	1.37	1.18	1.754	0.0000	Yes	PNL	25	1.21	0.45	6.0	(*N5)
CDP PANEL BX	CDP-BX FDR BK	0.48	2.18	1.36	1.12	2	0.0000	Yes	PNL	25	1.22	0.45	6.1	(*N9)
LC3A-MCC MAIN Bkr Line Side	G-LC-3 BK	0.48	1.57	1.40	1.02	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N3) (*N5) (*N9)
LC4A-MCC MAIN Bkr Line Side	G-LC-4 BK	0.48	1.57	1.40	1.02	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N3) (*N5) (*N9)
MCC LC-3	G-LC-3 BK	0.48	1.61	1.43	1.04	2	0.0000	Yes	PNL	25	1.21	0.45	5.9	(*N3) (*N9)
MCC LC-4	G-LC-4 BK	0.48	1.60	1.43	1.04	2	0.0000	Yes	PNL	25	1.21	0.45	5.9	(*N3) (*N9)
MCC-AX	GEN BK	0.48	2.24	1.25	1.02	2	0.0000	Yes	PNL	25	1.26	0.45	6.4	(*N9)
MCC-DX	MCC-DX FDR BK	0.48	2.16	1.35	0.94	0.4635	0.0000	Yes	PNL	25	0.48	0.45	1.3	(*N3)
MCC-EX	MCC-EX FDR BK	0.48	0.56	0.56	0.56	1.87	0.0000	Yes	PNL	25	0.44	0.45	1.1	(*N5) (*N1)
MCC-EX Line Side	MCC-EX FDR BK	0.48	0.96	0.96	0.75	0.9187	0.0000	Yes	PNL	25	0.53	0.45	1.5	(*N3)
TK71 MAIN BK Line Side	LC 71 FDR BK	0.48	1.27	1.26	0.95	1.91	0.0000	Yes	PNL	25	1.04	0.45	4.7	(*N3)
TK71 MCC	TK71 MAIN BK	0.48	1.27	1.26	0.95	1.91	0.0000	Yes	PNL	25	1.04	0.45	4.7	(*N3)
TK72 MAIN BK Line Side	LC 72 FDR BK	0.48	1.28	1.26	0.95	1.905	0.0000	Yes	PNL	25	1.04	0.45	4.7	(*N3)
TK72 MCC	TK72 MAIN BK	0.48	1.28	1.26	0.95	1.905	0.0000	Yes	PNL	25	1.04	0.45	4.7	(*N3)
TK73 MAIN BK Line Side	G-LC-4 BK	0.48	1.23	1.09	0.97	2	0.0000	Yes	PNL	25	1.17	0.45	5.6	(*N5) (*N9)
TK73 MCC	G-LC-4 BK	0.48	1.23	1.09	0.97	2	0.0000	Yes	PNL	25	1.17	0.45	5.6	(*N5) (*N9)
TK74 MAIN BK Line Side	G-LC-3 BK	0.48	1.16	1.04	0.93	2	0.0000	Yes	PNL	25	1.14	0.45	5.4	(*N5) (*N9)
TK74 MCC	TK74 MAIN BK	0.48	1.16	1.16	0.88	2	0.0000	Yes	PNL	25	1.03	0.45	4.5	(*N3) (*N9)

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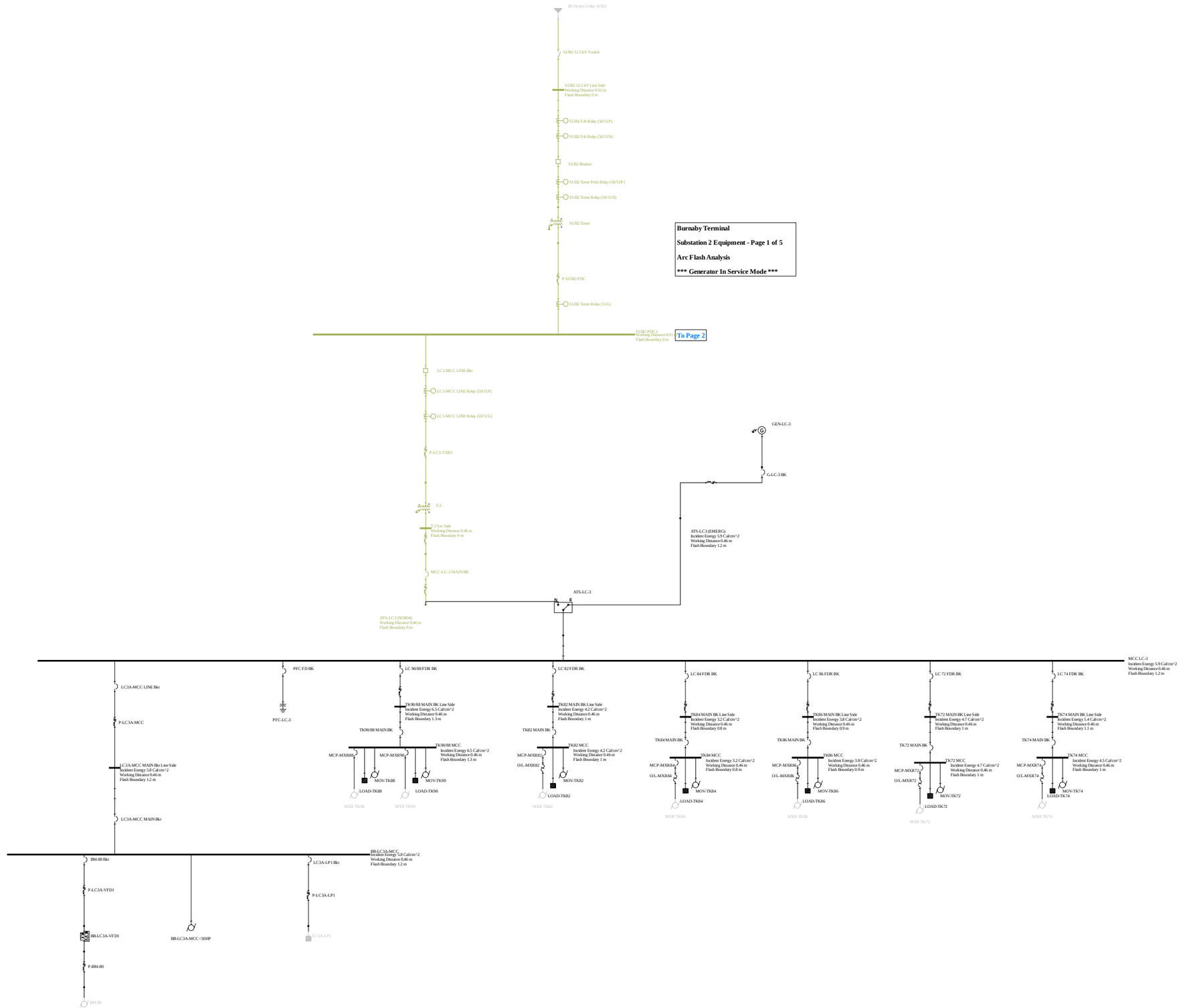
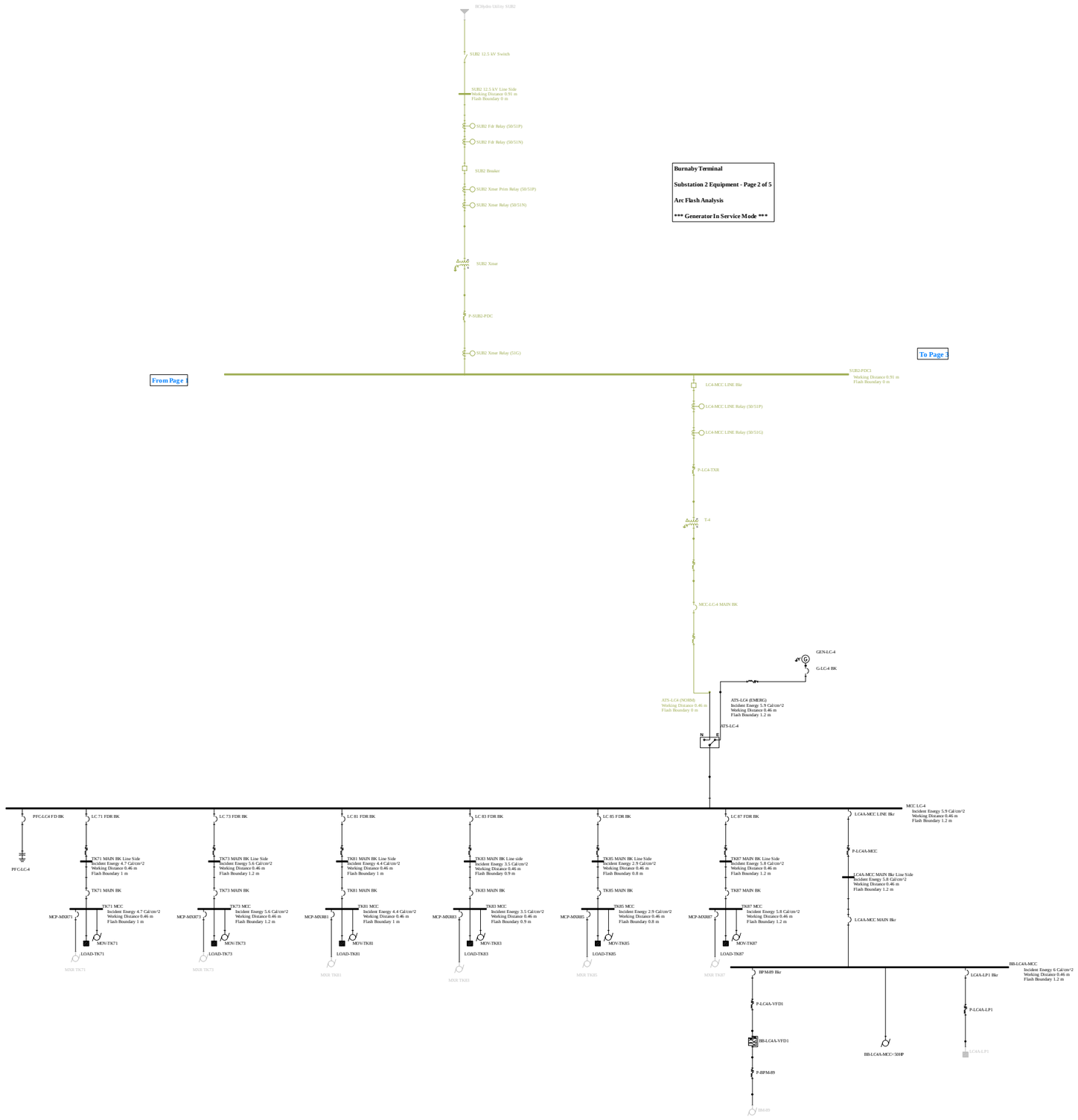
Arc Flash Results Emergency Generator Mode

Bus Name	Protective Device Name	Bus kV	Bus Bolted Fault (kA)	Prot Dev Bolted Fault (kA)	Prot Dev Arcing Fault (kA)	Trip/ Delay Time (sec.)	Breaker Opening Time (sec.)	Ground (Y/N)	Equip Type	Gap (mm)	Arc Flash Boundary (m)	Working Distance (m)	Incident Energy (cal/cm2)	Notes
TK81 MAIN BK Line Side	LC 81 FDR BK	0.48	1.30	1.29	0.97	1.759	0.0000	Yes	PNL	25	1.00	0.45	4.4	(*N3)
TK81 MCC	TK81 MAIN BK	0.48	1.30	1.29	0.97	1.759	0.0000	Yes	PNL	25	1.00	0.45	4.4	(*N3)
TK82 MAIN BK Line Side	LC 82 FDR BK	0.48	1.33	1.32	0.99	1.659	0.0000	Yes	PNL	25	0.98	0.45	4.2	(*N3)
TK82 MCC	TK82 MAIN BK	0.48	1.33	1.32	0.99	1.659	0.0000	Yes	PNL	25	0.98	0.45	4.2	(*N3)
TK83 MAIN BK Line side	LC 83 FDR BK	0.48	1.44	1.43	1.06	1.281	0.0000	Yes	PNL	25	0.87	0.45	3.5	(*N3)
TK83 MCC	TK83 MAIN BK	0.48	1.44	1.43	1.06	1.281	0.0000	Yes	PNL	25	0.87	0.45	3.5	(*N3)
TK84 MAIN BK Line Side	LC 84 FDR BK	0.48	1.49	1.49	1.09	1.139	0.0000	Yes	PNL	25	0.83	0.45	3.2	(*N3)
TK84 MCC	TK84 MAIN BK	0.48	1.49	1.49	1.09	1.139	0.0000	Yes	PNL	25	0.83	0.45	3.2	(*N3)
TK85 MAIN BK Line Side	LC 85 FDR BK	0.48	1.56	1.55	1.13	1.009	0.0000	Yes	PNL	25	0.79	0.45	2.9	(*N3)
TK85 MCC	TK85 MAIN BK	0.48	1.56	1.55	1.13	1.009	0.0000	Yes	PNL	25	0.79	0.45	2.9	(*N3)
TK86 MAIN BK Line Side	LC 86 FDR BK	0.48	1.42	1.40	1.04	1.401	0.0000	Yes	PNL	25	0.92	0.45	3.8	(*N3)
TK86 MCC	TK86 MAIN BK	0.48	1.42	1.40	1.04	1.401	0.0000	Yes	PNL	25	0.92	0.45	3.8	(*N3)
TK87 MAIN BK Line Side	G-LC-4 BK	0.48	1.26	1.12	1.00	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N5) (*N9)
TK87 MCC	G-LC-4 BK	0.48	1.26	1.12	1.00	2	0.0000	Yes	PNL	25	1.19	0.45	5.8	(*N5) (*N9)
TK90/88 MAIN BK Line Side	G-LC-3 BK	0.48	1.47	1.31	1.14	1.981	0.0000	Yes	PNL	25	1.28	0.45	6.5	(*N5)
TK90/88 MCC	G-LC-3 BK	0.48	1.47	1.31	1.14	1.981	0.0000	Yes	PNL	25	1.28	0.45	6.5	(*N5)

(*N1) - Out of IEEE 1584 Range; Lee Equation Used
(*N2) < 80% Cleared Fault Threshold
(*N3) - Arcing Current Low Tolerances Used
(*N5) - Miscoordinated, Upstream Device Tripped
(*N9) - Max Arcing Duration Reached


BC Hydro Utility SUB2
SUB2 12.5 kV Switch
SUB2 12.5 kV Line Side
Working Distance 0.91 m
Flash Boundary 0 m
SUB2 Fdr Relay (50/51P)
SUB2 Fdr Relay (50/51N)
SUB2 Breaker
SUB2 Xmer Prim Relay (50/51P)
SUB2 Xmer Relay (50/51N)
SUB2 Xmer
P-SUB2-PDC
SUB2 Xmer Relay (51G)
SUB2-PDC1
Working Distance 0.91 m
Flash Boundary 0 m
To Page 2
Burnaby Terminal
Substation 2 Equipment - Page 1 of 5
Arc Flash Analysis
*** Generator In Service Mode ***
LC3-MCC LINE Bkr
LC3-MCC LINE Relay (50/51P)
LC3-MCC LINE Relay (50/51G)
P-LC3-TXR1
T-3
T-3 Sec Side
Working Distance 0.46 m
Flash Boundary 0 m
MCC-LC-3 MAIN BK
GEN-LC-3
G-LC-3 BK
ATS-LC-3 (EMERG)
Incident Energy 5.9 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
ATS-LC-3
N
E
ATS-LC-3 (NORM)
Working Distance 0.46 m
Flash Boundary 0 m
MCC LC-3
Incident Energy 5.9 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
LC3A-MCC LINE Bkr
P-LC3A-MCC
LC3A-MCC MAIN Bkr Line Side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
LC3A-MCC MAIN Bkr
PFC-FD BK
PFC-LC-3
LC 90/88 FDR BK
TK90/88 MAIN BK Line Side
Incident Energy 6.5 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.3 m
TK90/88 MAIN BK
TK90/88 MCC
Incident Energy 6.5 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.3 m
MCP-MXR88
MCP-MXR90
MOV-TK88
MOV-TK90
LOAD-TK88
LOAD-TK90
MXR TK88
MXR TK90
LC 82 FDR BK
TK82 MAIN BK Line Side
Incident Energy 4.2 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
TK82 MAIN BK
TK82 MCC
Incident Energy 4.2 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
MCP-MXR82
O/L-MXR82
MOV-TK82
LOAD-TK82
MXR TK82
LC 84 FDR BK
TK84 MAIN BK Line Side
Incident Energy 3.2 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.8 m
TK84 MAIN BK
TK84 MCC
Incident Energy 3.2 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.8 m
MCP-MXR84
O/L-MXR84
MOV-TK84
LOAD-TK84
MXR TK84
LC 86 FDR BK
TK86 MAIN BK Line Side
Incident Energy 3.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.9 m
TK86 MAIN BK
TK86 MCC
Incident Energy 3.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.9 m
MCP-MXR86
O/L-MXR86
MOV-TK86
LOAD-TK86
MXR TK86
LC 72 FDR BK
TK72 MAIN BK Line Side
Incident Energy 4.7 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
TK72 MAIN BK
TK72 MCC
Incident Energy 4.7 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
MCP-MXR72
O/L-MXR72
MOV-TK72
LOAD-TK72
MXR TK72
LC 74 FDR BK
TK74 MAIN BK Line Side
Incident Energy 5.4 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.1 m
TK74 MAIN BK
TK74 MCC
Incident Energy 4.5 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
MCP-MXR74
O/L-MXR74
MOV-TK74
LOAD-TK74
MXR TK74
BB-LC3A-MCC
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BM-80 Bkr
P-LC3A-VFD1
BB-LC3A-VFD1
P-BM-80
BM-80
BB-LC3A-MCC<50HP
LC3A-LP1 Bkr
P-LC3A-LP1
LC3A-LP1


BC Hydro Utility SUB2
SUB2 12.5 kV Switch
SUB2 12.5 kV Line Side
Working Distance 0.91 m
Flash Boundary 0 m
SUB2 Fdr Relay (50/51P)
SUB2 Fdr Relay (50/51N)
SUB2 Breaker
SUB2 Xmer Prim Relay (50/51P)
SUB2 Xmer Relay (50/51N)
SUB2 Xmer
P-SUB2-PDC
SUB2 Xmer Relay (51G)
Burnaby Terminal
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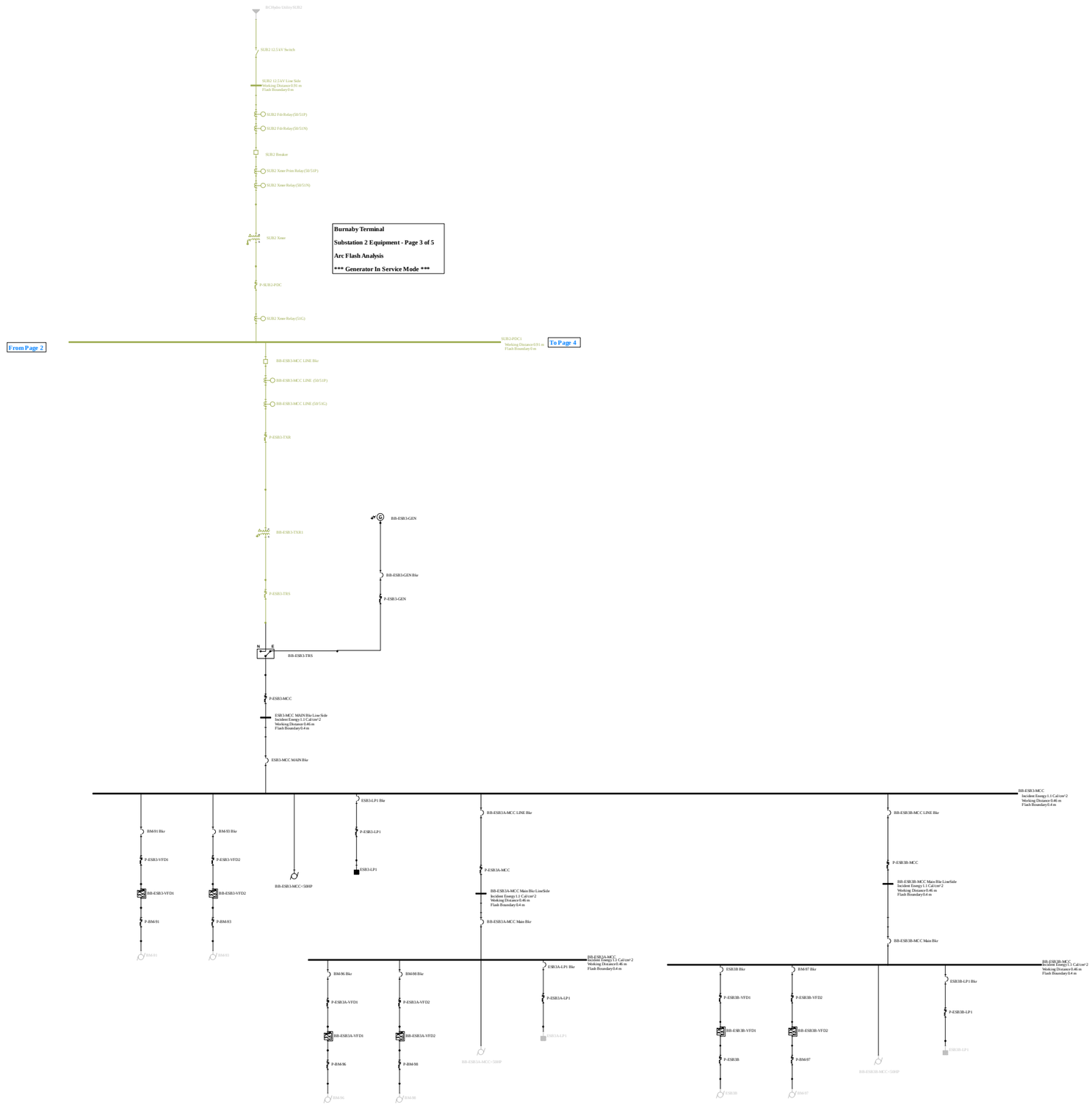
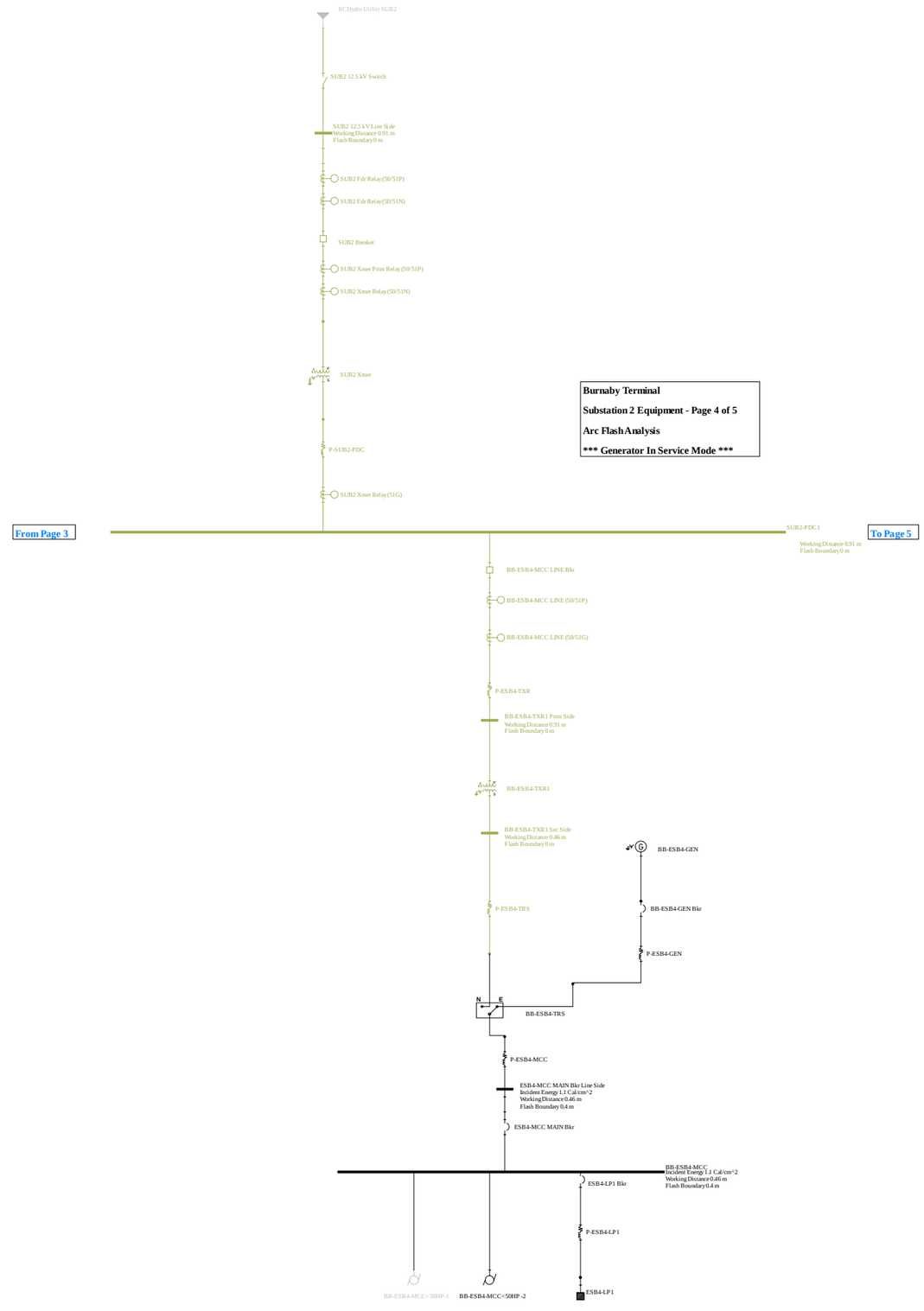
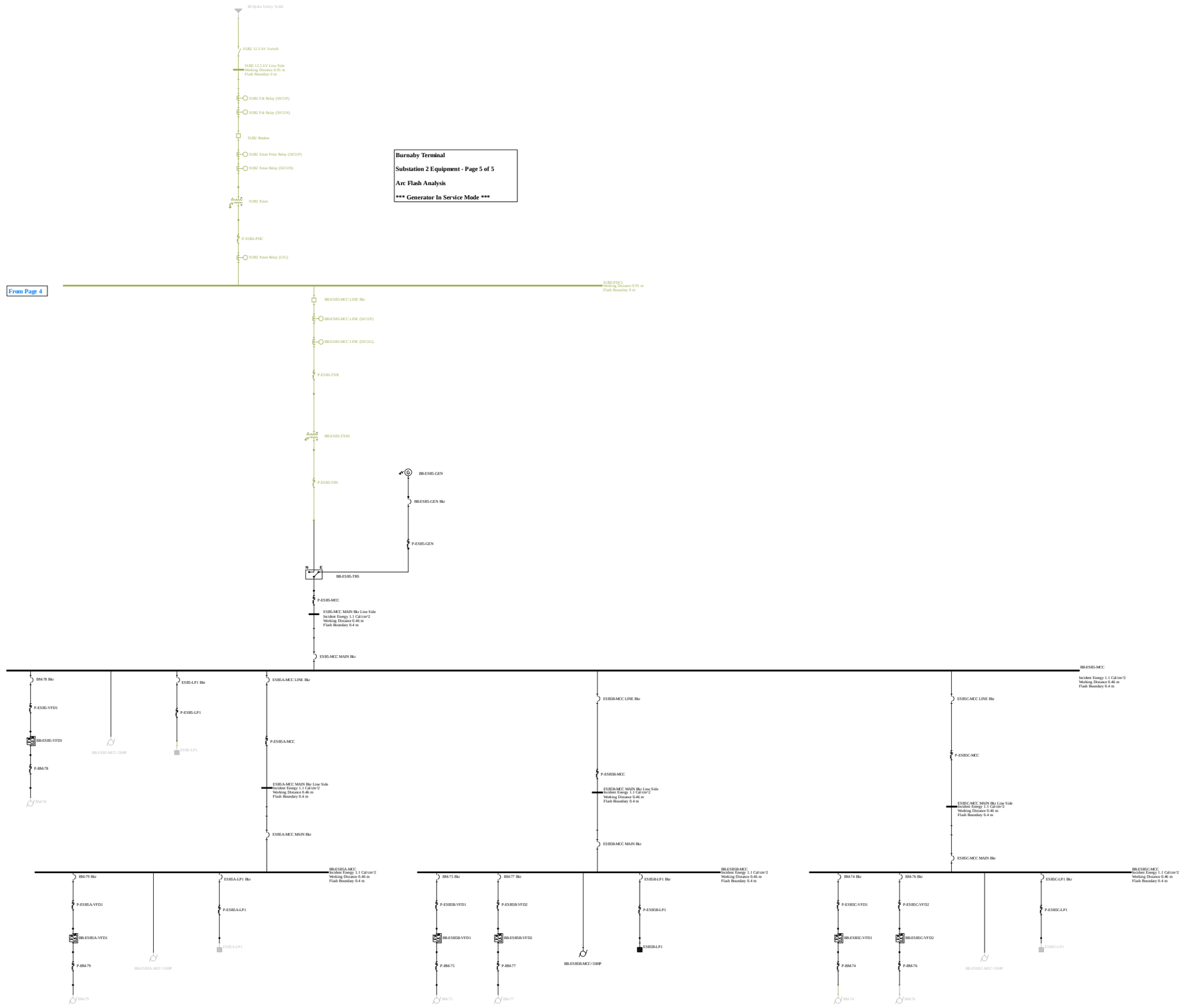
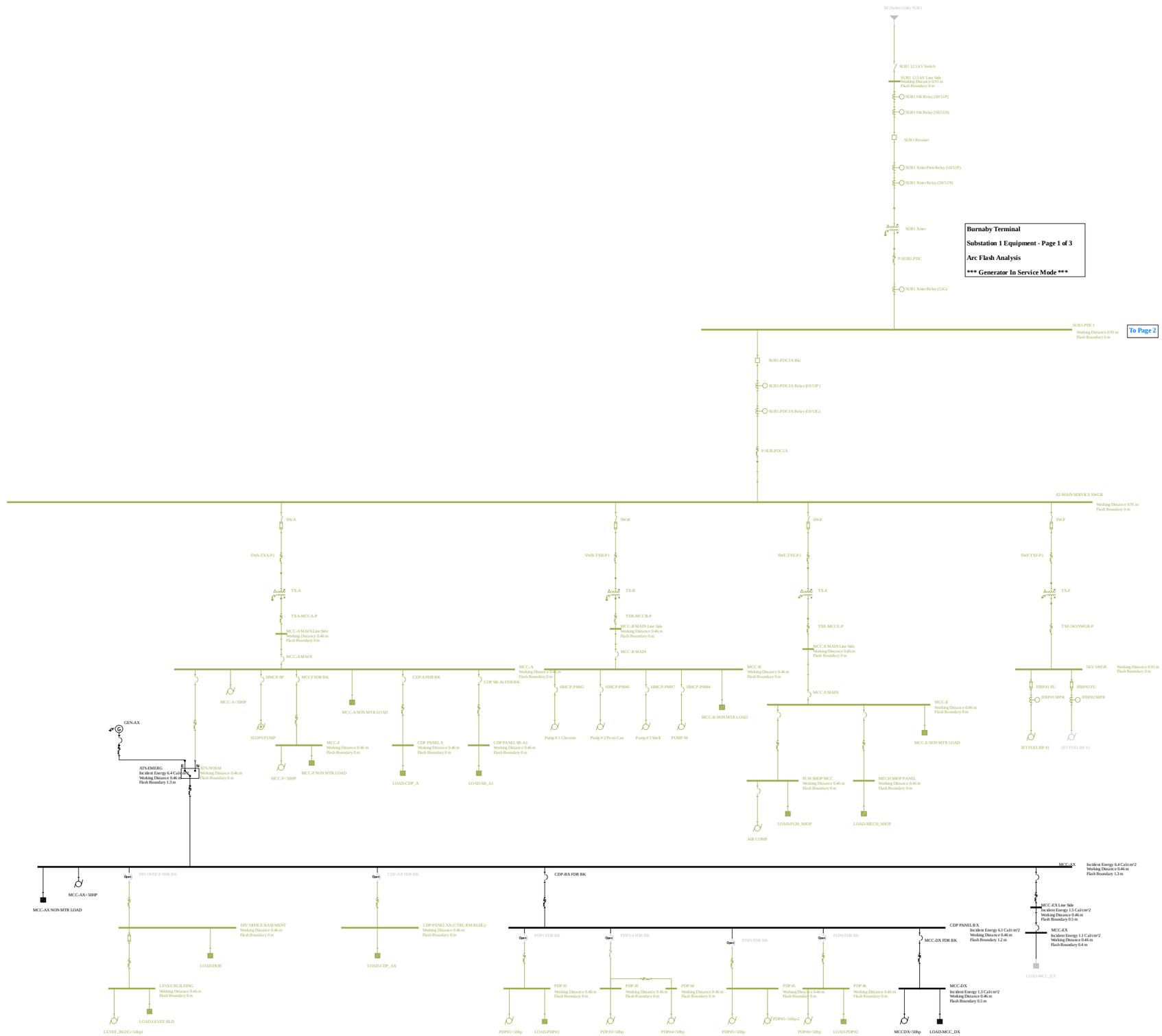
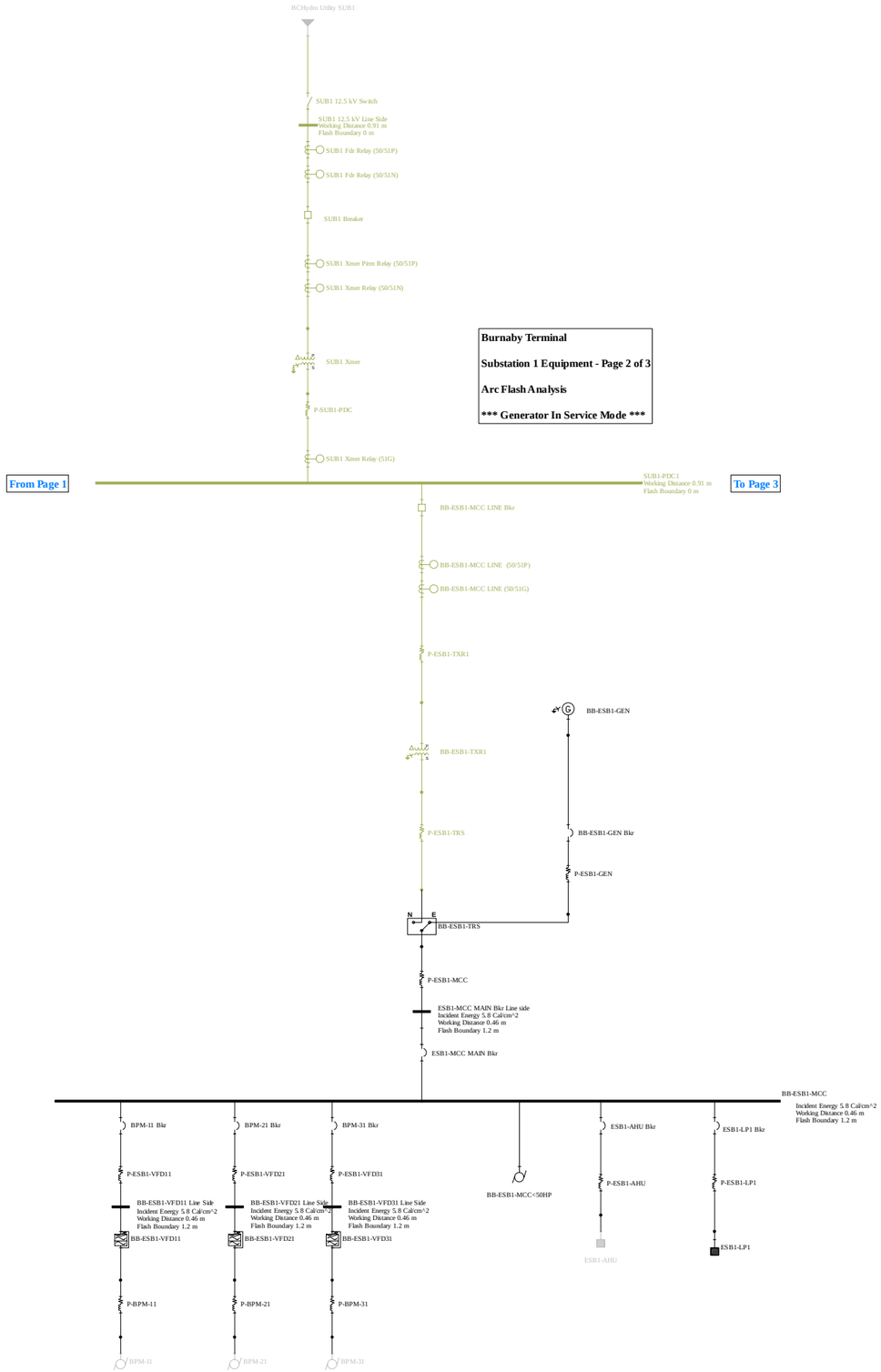
Arc Flash Analysis
*** Generator In Service Mode ***
To Page 3
From Page 1
SUB2-PDC1
Working Distance 0.91 m
Flash Boundary 0 m
LC4-MCC LINE Bkr
LC4-MCC LINE Relay (50/51P)
LC4-MCC LINE Relay (50/51G)
P-LC4-TXR
T-4
MCC-LC-4 MAIN BK
GEN-LC-4
G-LC-4 BK
ATS-LC4 (NORM)
Working Distance 0.46 m
Flash Boundary 0 m
ATS-LC4 (EMERG)
Incident Energy 5.9 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
ATS-LC-4
N
E
MCC LC-4
Incident Energy 5.9 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
PFC-LC4 FD BK
PFC-LC4
LC 71 FDR BK
LC 73 FDR BK
LC 81 FDR BK
LC 83 FDR BK
LC 85 FDR BK
LC 87 FDR BK
LC4A-MCC LINE Bkr
P-LC4A-MCC
LC4A-MCC MAIN Bkr Line Side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
LC4A-MCC MAIN Bkr
TK71 MAIN BK Line Side
Incident Energy 4.7 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
TK73 MAIN BK Line Side
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
TK81 MAIN BK Line Side
Incident Energy 4.4 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
TK83 MAIN BK Line side
Incident Energy 3.5 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.9 m
TK85 MAIN BK Line Side
Incident Energy 2.9 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.8 m
TK87 MAIN BK Line Side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
TK71 MAIN BK
TK73 MAIN BK
TK81 MAIN BK
TK83 MAIN BK
TK85 MAIN BK
TK87 MAIN BK
TK71 MCC
Incident Energy 4.7 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
TK73 MCC
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
TK81 MCC
Incident Energy 4.4 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1 m
TK83 MCC
Incident Energy 3.5 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.9 m
TK85 MCC
Incident Energy 2.9 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.8 m
TK87 MCC
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
MCP-MXR71
MCP-MXR73
MCP-MXR81
MCP-MXR83
MCP-MXR85
MCP-MXR87
MOV-TK71
MOV-TK73
MOV-TK81
MOV-TK83
MOV-TK85
MOV-TK87
LOAD-TK71
LOAD-TK73
LOAD-TK81
LOAD-TK83
LOAD-TK85
LOAD-TK87
MXR TK71
MXR TK73
MXR TK81
MXR TK83
MXR TK85
MXR TK87
BB-LC4A-MCC
Incident Energy 6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BPM-89 Bkr
LC4A-LP1 Bkr
P-LC4A-VFD1
P-LC4A-LP1
BB-LC4A-VFD1
BB-LC4A-MCC-VFD1
BB-LC4A-MCC-301P
LC4A-LP1
P-BPM-89
BM-89

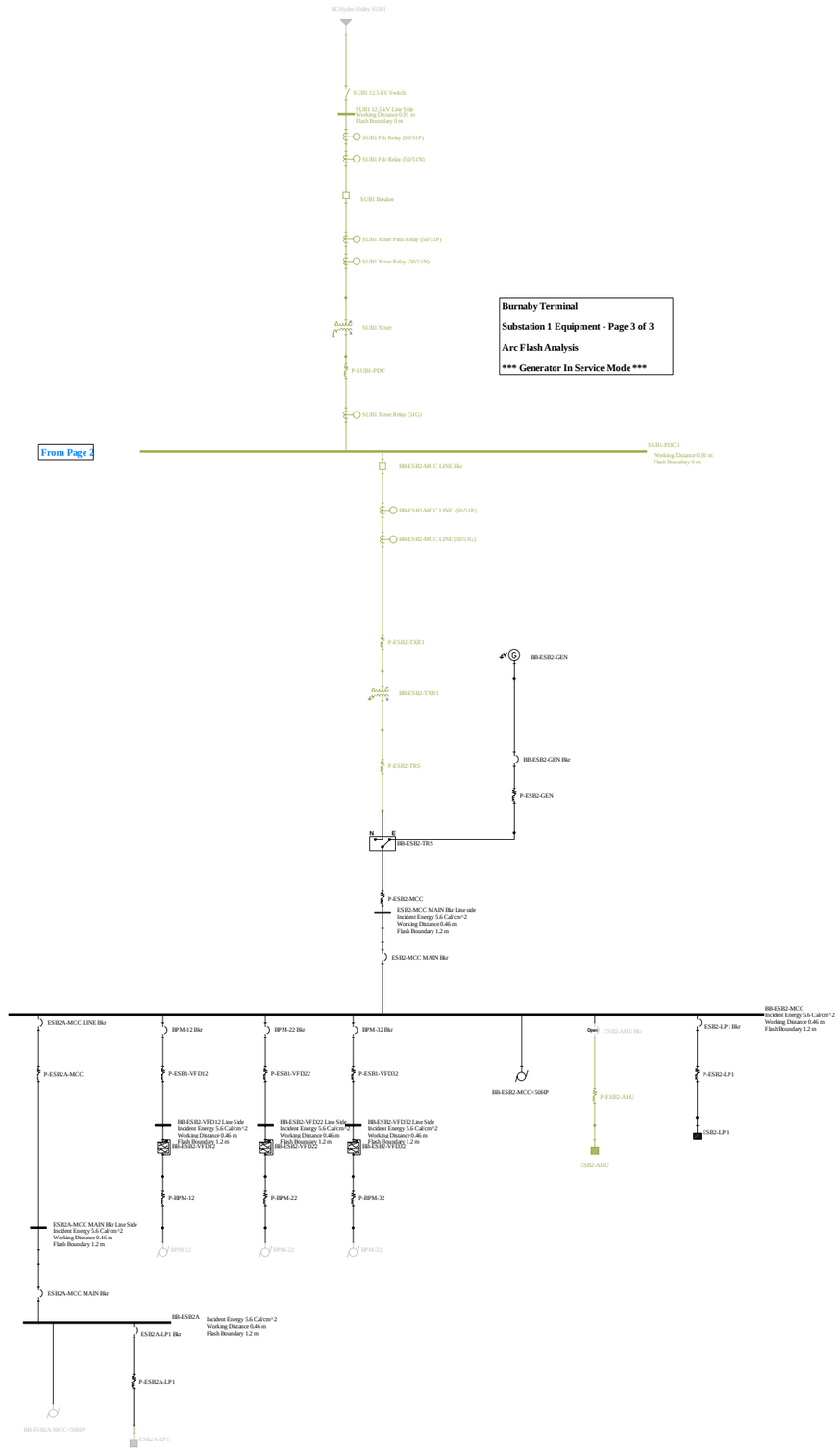

BC Hydro Utility SUB2
SUB2 12.5 kV Switch
SUB2 12.5 kV Line Side
Working Distance:0.91 m
Flash Boundary:0 m
SUB2 F.O/ Relay (50/51P)
SUB2 F.O/ Relay (50/51N)
SUB2 Breaker
SUB2 Xmer Prim Relay (50/51P)
SUB2 Xmer Relay (50/51N)
SUB2 Xmer
Burnaby Terminal
Substation 2 Equipment - Page 3 of 5
Arc Flash Analysis
*** Generator In Service Mode ***
P-SUB2-PDC
SUB2 Xmer Relay (51G)
From Page 2
SUB2-PDC1
Working Distance:0.91 m
Flash Boundary:0 m
To Page 4
BB-ESB3-MCC LINE Bkr
BB-ESB3-MCC LINE (50/51P)
BB-ESB3-MCC LINE (50/51G)
P-ESB3-TXR
BB-ESB3-TXR1
BB-ESB3-GEN
BB-ESB3-GEN Bkr
P-ESB3-GEN
P-ESB3-TRS
N
E
BB-ESB3-TRS
P-ESB3-MCC
ESB3-MCC MAIN Bkr Line Side
Incident Energy:1.1 Cal/cm^2
Working Distance:0.46 m
Flash Boundary:0.4 m
ESB3-MCC MAIN Bkr
BB-ESB3-MCC
Incident Energy:1.1 Cal/cm^2
Working Distance:0.46 m
Flash Boundary:0.4 m
BM-91 Bkr
BM-93 Bkr
P-ESB3-VFD1
P-ESB3-VFD2
BB-ESB3-VFD1
BB-ESB3-VFD2
P-BM-91
P-BM-93
BM-91
BM-93
BB-ESB3-MCC<50HP
ESB3-LP1 Bkr
P-ESB3-LP1
ESB3-LP1
BB-ESB3A-MCC LINE Bkr
P-ESB3A-MCC
BB-ESB3A-MCC Main Bkr Line Side
Incident Energy:1.1 Cal/cm^2
Working Distance:0.46 m
Flash Boundary:0.4 m
BB-ESB3A-MCC Main Bkr
BB-ESB3B-MCC LINE Bkr
P-ESB3B-MCC
BB-ESB3B-MCC Main Bkr Line Side
Incident Energy:1.1 Cal/cm^2
Working Distance:0.46 m
Flash Boundary:0.4 m
BB-ESB3B-MCC Main Bkr
BB-ESB3A-MCC
Incident Energy:1.1 Cal/cm^2
Working Distance:0.46 m
Flash Boundary:0.4 m
BM-96 Bkr
BM-98 Bkr
P-ESB3A-VFD1
P-ESB3A-VFD2
BB-ESB3A-VFD1
BB-ESB3A-VFD2
P-BM-96
P-BM-98
BM-96
BM-98
BB-ESB3A-MCC<50HP
ESB3A-LP1 Bkr
P-ESB3A-LP1
ESB3A-LP1
BB-ESB3B-MCC
Incident Energy:1.1 Cal/cm^2
Working Distance:0.46 m
Flash Boundary:0.4 m
ESB3B Bkr
BM-97 Bkr
P-ESB3B-VFD1
P-ESB3B-VFD2
BB-ESB3B-VFD1
BB-ESB3B-VFD2
P-ESB3B
P-BM-97
ESB3B
BM-97
BB-ESB3B-MCC<50HP
ESB3B-LP1 Bkr
P-ESB3B-LP1
ESB3B-LP1


BCHydro Utility SUB2
SUB2 12.5 kV Switch
SUB2 12.5 kV Line Side
Working Distance 0.91 m
Flash Boundary 0 m
SUB2 Fdr Relay (50/51P)
SUB2 Fdr Relay (50/51N)
SUB2 Breaker
SUB2 Xmer Prim Relay (50/51P)
SUB2 Xmer Relay (50/51N)
SUB2 Xmer
P-SUB2-PDC
SUB2 Xmer Relay (51G)
Burnaby Terminal
Substation 2 Equipment - Page 4 of 5
Arc Flash Analysis
*** Generator In Service Mode ***
From Page 3
SUB2-PDC1
To Page 5
Working Distance 0.91 m
Flash Boundary 0 m
BB-ESB4-MCC LINE Bkr
BB-ESB4-MCC LINE (50/51P)
BB-ESB4-MCC LINE (50/51G)
P-ESB4-TXR
BB-ESB4-TXR1 Prim Side
Working Distance 0.91 m
Flash Boundary 0 m
BB-ESB4-TXR1
BB-ESB4-TXR1 Sec Side
Working Distance 0.46 m
Flash Boundary 0 m
BB-ESB4-GEN
BB-ESB4-GEN Bkr
P-ESB4-GEN
P-ESB4-TRS
N
E
BB-ESB4-TRS
P-ESB4-MCC
ESB4-MCC MAIN Bkr Line Side
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.4 m
ESB4-MCC MAIN Bkr
BB-ESB4-MCC
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.4 m
ESB4-LP1 Bkr
P-ESB4-LP1
ESB4-LP1
BB-ESB4-MCC<50HP-1
BB-ESB4-MCC<50HP -2


BC Hydro Utility SUB2
SUB2 12.5 kV Switch
SUB2 12.5 kV Line Side
Working Distance 0.91 in
Flash Boundary 0 in
SUB2 Fdr Relay (50/51P)
SUB2 Fdr Relay (50/51N)
SUB2 Breaker
SUB2 Xmer Prim Relay (50/51P)
SUB2 Xmer Relay (50/51N)
SUB2 Xmer
P-SUB2-PDC
SUB2 Xmer Relay (51G)
Burnaby Terminal
Substation 2 Equipment - Page 5 of 5
Arc Flash Analysis
*** Generator In Service Mode ***
From Page 4
SUB2-PDC1
Working Distance 0.91 in
Flash Boundary 0 in
BB-ESB5-MCC LINE Bkr
BB-ESB5-MCC LINE (50/51P)
BB-ESB5-MCC LINE (50/51G)
P-ESB5-TXR
BB-ESB5-TXR1
P-ESB5-TRS
BB-ESB5-GEN
BB-ESB5-GEN Bkr
P-ESB5-GEN
N
E
BB-ESB5-TRS
P-ESB5-MCC
ESB5-MCC MAIN Bkr Line Side
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
ESB5-MCC MAIN Bkr
BB-ESB5-MCC
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
BM-78 Bkr
P-ESB5-VFD1
BB-ESB5-VFD1
P-BM-78
BM-78
BB-ESB5-MCC<50HP
ESB5-LP1 Bkr
P-ESB5-LP1
ESB5-LP1
ESB5A-MCC LINE Bkr
P-ESB5A-MCC
ESB5A-MCC MAIN Bkr Line Side
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
ESB5A-MCC MAIN Bkr
ESB5B-MCC LINE Bkr
P-ESB5B-MCC
ESB5B-MCC MAIN Bkr Line Side
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
ESB5B-MCC MAIN Bkr
ESB5C-MCC LINE Bkr
P-ESB5C-MCC
ESB5C-MCC MAIN Bkr Line Side
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
ESB5C-MCC MAIN Bkr
BB-ESB5A-MCC
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
BM-79 Bkr
P-ESB5A-VFD1
BB-ESB5A-VFD1
P-BM-79
BM-79
BB-ESB5A-MCC<50HP
ESB5A-LP1 Bkr
P-ESB5A-LP1
ESB5A-LP1
BB-ESB5B-MCC
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
BM-75 Bkr
P-ESB5B-VFD1
BB-ESB5B-VFD1
P-BM-75
BM-75
BM-77 Bkr
P-ESB5B-VFD2
BB-ESB5B-VFD2
P-BM-77
BM-77
BB-ESB5B-MCC<50HP
ESB5B-LP1 Bkr
P-ESB5B-LP1
ESB5B-LP1
BB-ESB5C-MCC
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 in
Flash Boundary 0.4 in
BM-74 Bkr
P-ESB5C-VFD1
BB-ESB5C-VFD1
P-BM-74
BM-74
BM-76 Bkr
P-ESB5C-VFD2
BB-ESB5C-VFD2
P-BM-76
BM-76
BB-ESB5C-MCC<50HP
ESB5C-LP1 Bkr
P-ESB5C-LP1
ESB5C-LP1


BC Hydro Utility SUB1
SUB1 12.5 kV Switch
SUB1 12.5 kV Line Side
Working Distance 0.91 m
Flash Boundary 0 m
SUB1 Fdr Relay (50/51P)
SUB1 Fdr Relay (50/51N)
SUB1 Breaker
SUB1 Xmer Prm Relay (50/51P)
SUB1 Xmer Relay (50/51N)
SUB1 Xmer
P-SUB1-PDC
SUB1 Xmer Relay (51G)
Burnaby Terminal
Substation 1 Equipment - Page 1 of 3
Arc Flash Analysis
*** Generator In Service Mode ***
SUB1-PDC1
Working Distance 0.91 m
Flash Boundary 0 m
To Page 2
SUB1-PDC1A Bkr
SUB1-PDC1A Relay (50/51P)
SUB1-PDC1A Relay (50/51G)
P-SUB-PDC1A
02-MAIN SERVICE SWGR
Working Distance 0.91 m
Flash Boundary 0 m
SW-A
SWB-TXA-P1
TX-A
TXA-MCCA-P
MCC-A MAIN Line Side
Working Distance 0.46 m
Flash Boundary 0 m
MCC-A MAIN
SW-B
SWB-TXB-P1
TX-B
TXB-MCCB-P
MCC-B MAIN Line Side
Working Distance 0.46 m
Flash Boundary 0 m
MCC-B MAIN
SW-E
SWE-TXE-P1
TX-E
TXE-MCCE-P
MCC-E MAIN Line Side
Working Distance 0.46 m
Flash Boundary 0 m
MCC-E MAIN
SW-F
SWF-TXF-P1
TX-F
TXF-SKVSWGR-P
SKV SWGR
Working Distance 0.91 m
Flash Boundary 0 m
JFBP#1 FU
JFBP#2 FU
JFBP#1 MFR
JFBP#2 MFR
JET FUEL BP #1
JET FUEL BP #2
MCC-A
Working Distance 0.46 m
Flash Boundary 0 m
HMCP-SP
MCC-A<50HP
SLOPS PUMP
MCCF FDR BK
MCC-F
Working Distance 0.46 m
Flash Boundary 0 m
MCC-F<50HP
MCC-F NON MTR LOAD
MCC-A NON MTR LOAD
CDP A FDR BK
CDP PANEL A
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-CDP_A
CDP Sth-Al FDR BK
CDP PANEL SB-A1
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-SB_A1
MCC-B
Working Distance 0.46 m
Flash Boundary 0 m
HMCP-PM#5
HMCP-PM#6
HMCP-PM#7
HMCP-PM#4
Pump # 1 Chevron
Pump # 2 Pevro Can
Pump # 3 Shell
PUMP #4
MCC-B NON MTR LOAD
MCC-E
Working Distance 0.46 m
Flash Boundary 0 m
MCC-E NON MTR LOAD
PLM SHOP MCC
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-PLM_SHOP
MECH SHOP PANEL
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-MECH_SHOP
AIR COMP
GEN-AX
ATS-EMERG
Incident Energy 6.4 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.3 m
ATS-NORM
Working Distance 0.46 m
Flash Boundary 0 m
MCC-AX NON MTR LOAD
MCC-AX<50HP
Open
DIV OFFICE FDR BK
DIV. OFFICE BASEMENT
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-DOB
LEVEE BUILDING
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-LEVEE BLD
LEVEE_BLDG<50hp1
CDP-AX FDR BK
CDP PANEL AX (CTRL RM BLDG)
Working Distance 0.46 m
Flash Boundary 0 m
LOAD-CDP_AX
CDP-BX FDR BK
CDP PANEL B X
Incident Energy 6.1 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
PDP1 FDR BK
PDP3/4 FDR BK
PDP5 FDR BK
PDP6 FDR BK
MCC-DX FDR BK
PDP #1
Working Distance 0.46 m
Flash Boundary 0 m
PDP #3
Working Distance 0.46 m
Flash Boundary 0 m
PDP #4
Working Distance 0.46 m
Flash Boundary 0 m
PDP #5
Working Distance 0.46 m
Flash Boundary 0 m
PDP #6
Working Distance 0.46 m
Flash Boundary 0 m
PDP#1<50hp
LOAD-PDP#1
PDP#3<50hp
PDP#4<50hp
PDP#5<50hp
PDP#5<50hp-2
PDP#6<50hp
LOAD-PDP#2
MCC-DX
Incident Energy 1.3 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.5 m
MCCDX<50hp
LOAD-MCC_DX
MCC-EX
Incident Energy 6.4 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.3 m
MCC-EX Line Side
Incident Energy 1.3 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.5 m
MCC-EX
Incident Energy 1.1 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 0.4 m
LOAD-MCC_EX


BCHydro Utility SUB1
SUB1 12.5 kV Switch
SUB1 12.5 kV Line Side
Working Distance 0.91 m
Flash Boundary 0 m
SUB1 Fdr Relay (50/51P)
SUB1 Fdr Relay (50/51N)
SUB1 Breaker
SUB1 Xmer Pirm Relay (50/51P)
SUB1 Xmer Relay (50/51N)
SUB1 Xmer
P-SUB1-PDC
SUB1 Xmer Relay (51G)
Burnaby Terminal
Substation 1 Equipment - Page 2 of 3
Arc Flash Analysis
*** Generator In Service Mode ***
From Page 1
SUB1-PDC1
Working Distance 0.91 m
Flash Boundary 0 m
To Page 3
BB-ESB1-MCC LINE Bkr
BB-ESB1-MCC LINE (50/51P)
BB-ESB1-MCC LINE (50/51G)
P-ESB1-TXR1
BB-ESB1-GEN
BB-ESB1-TXR1
P-ESB1-TRS
BB-ESB1-GEN Bkr
P-ESB1-GEN
N
E
BB-ESB1-TRS
P-ESB1-MCC
ESB1-MCC MAIN Bkr Line side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
ESB1-MCC MAIN Bkr
BB-ESB1-MCC
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BPM-11 Bkr
BPM-21 Bkr
BPM-31 Bkr
BB-ESB1-MCC<50HP
ESB1-AHU Bkr
ESB1-LP1 Bkr
P-ESB1-VFD11
P-ESB1-VFD21
P-ESB1-VFD31
P-ESB1-AHU
P-ESB1-LP1
BB-ESB1-VFD11 Line Side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BB-ESB1-VFD21 Line Side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BB-ESB1-VFD31 Line Side
Incident Energy 5.8 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BB-ESB1-VFD11
BB-ESB1-VFD21
BB-ESB1-VFD31
ESB1-AHU
ESB1-LP1
P-BPM-11
P-BPM-21
P-BPM-31
BPM-11
BPM-21
BPM-31


BCHydro Utility SUB1
SUB1 12.5 kV Switch
SUB1 12.5 kV Line Side
Working Distance 0.91 m
Flash Boundary 0 m
SUB1 Fdr Relay (50/51P)
SUB1 Fdr Relay (50/51N)
SUB1 Breaker
SUB1 Xmer Prim Relay (50/51P)
SUB1 Xmer Relay (50/51N)
SUB1 Xmer
P-SUB1-PDC
SUB1 Xmer Relay (51G)
Burnaby Terminal
Substation 1 Equipment - Page 3 of 3
Arc Flash Analysis
*** Generator In Service Mode ***
From Page 2
SUB1-PDC1
Working Distance 0.91 m
Flash Boundary 0 m
BB-ESB2-MCC LINE Bkr
BB-ESB2-MCC LINE (50/51P)
BB-ESB2-MCC LINE (50/51G)
P-ESB2-TXR1
BB-ESB2-TXR1
P-ESB2-TRS
BB-ESB2-GEN
BB-ESB2-GEN Bkr
P-ESB2-GEN
N
E
BB-ESB2-TRS
P-ESB2-MCC
ESB2-MCC MAIN Bkr Line side
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
ESB2-MCC MAIN Bkr
BB-ESB2-MCC
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
ESB2-MCC LINE Bkr
BPM-12 Bkr
BPM-22 Bkr
BPM-32 Bkr
Open
ESB2-AHU Bkr
ESB2-LP1 Bkr
P-ESB2-MCC
P-ESB1-VFD12
P-ESB1-VFD22
P-ESB1-VFD32
BB-ESB2-MCC<50HP
P-ESB2-AHU
P-ESB2-LP1
BB-ESB2-VFD12 Line Side
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BB-ESB2-VFD12
BB-ESB2-VFD22 Line Side
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BB-ESB2-VFD22
BB-ESB2-VFD32 Line Side
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BB-ESB2-VFD32
ESB2-AHU
ESB2-LP1
P-BPM-12
P-BPM-22
P-BPM-32
ESB2A-MCC MAIN Bkr Line Side
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
BPM-12
BPM-22
BPM-32
ESB2A-MCC MAIN Bkr
BB-ESB2A
Incident Energy 5.6 Cal/cm^2
Working Distance 0.46 m
Flash Boundary 1.2 m
ESB2A-LP1 Bkr
P-ESB2A-LP1
BB-ESB2A-MCC<50HP
ESB2A-LP1

Appendix 4
Reference Drawings

APPENDIX 4 – REFERENCE DRAWINGS

Number	Rev	Title
BB00-EE1023	0	480V SINGLE LINE DIAGRAM MCC F JET FUEL AREA
BB00-EE1025	1	480V SINGLE LINE DIAGRAM MCC B LOWER TANK FARM AREA
BB00-EE1027	1	480V SINGLE LINE DIAGRAM CDP PANEL BX LOWER TANK FARM AREA
BB00-EE1029	4	480V SINGLE LINE DIAGRAM P.L.M. SHOP AND MECHANICAL BLDG.
BB00-EE1041	2	480V SINGLE LINE DIAGRAM POWER DISTRIBUTION MCC B PANEL 1 LOWER TANK FARM AREA
BB00-EE1042	2	480V SINGLE LINE DIAGRAM POWER DISTRIBUTION MCC B PANEL 3 LOWER TANK FARM
BB00-EE1043	2	480V SINGLE LINE DIAGRAM POWER DISTRIBUTION MCC B PANEL 4 LOWER TANK FARM AREA
BB00-EE1044	1	480V SINGLE LINE DIAGRAM POWER DISTRIBUTION MCC B PANEL 5 LOWER TANK FARM AREA
BB00-EE1045	4	SINGLE LINE DIAGRAM POWER DISTRIBUTION PANEL 6 (480 V) IN MCC-B BLDG
BB00-EE1046	1	480V SINGLE LINE DIAGRAM CDP PANEL BOARD SB-A1 E/I BUILDING
BB00-EE1047	1	480V SINGLE LINE DIAGRAM MCC E & MCC EX
BB00-EE1311	0	SINGLE LINE DIAGRAM CDP PANEL A CONTROL ROOM BUILDING
BB00-EE1312	0	SINGLE LINE DIAGRAM CDP PANEL AX GENERATOR POWER CONTROL ROOM
BB00-EE1024 SHT 1	8	480V MCC A SINGLE LINE DIAGRAM LOWER TANK FARM AREA
BB00-EE1026 SHT 1	5	480V- MCC AX SINGLE LINE DIAGRAM LOWER TANK FARM AREA
01-13279-C1A01-BB00-EE1031	2	SINGLE LINE DIAGRAM TK81 MCC TANK 81
01-13343-C1A01-BB00-EE1032 SHT 2	4	SINGLE LINE DIAGRAM 480V TK83 MCC TK83 LC BUILDING
01-13343-C1A01-BB00-EE1036 SHT 2	2	SINGLE LINE DIAGRAM TK82 MCC TANK 82
01-13343-C1A01-BB00-EE1037 SHT 2	4	SINGLE LINE DIAGRAM TK84 MCC TANK 84
01-13343-C1A01-BB00-EE1040 SHT 2	3	SINGLE LINE DIAGRAM TK74 MCC TANK 74
BB00-EE1322 SHT2	2	SINGLE LINE DIAGRAM TANK 90/88
BB00-EE1323	4	SINGLE LINE DIAGRAM TANK 87 MCC PANEL NLP-87A
01-13104-C1A01-BB00-EE1466 SHT 1	1	SINGLE LINE DIAGRAM NAEMS UPPER ROAD TANK 88

APPENDIX 4 – REFERENCE DRAWINGS

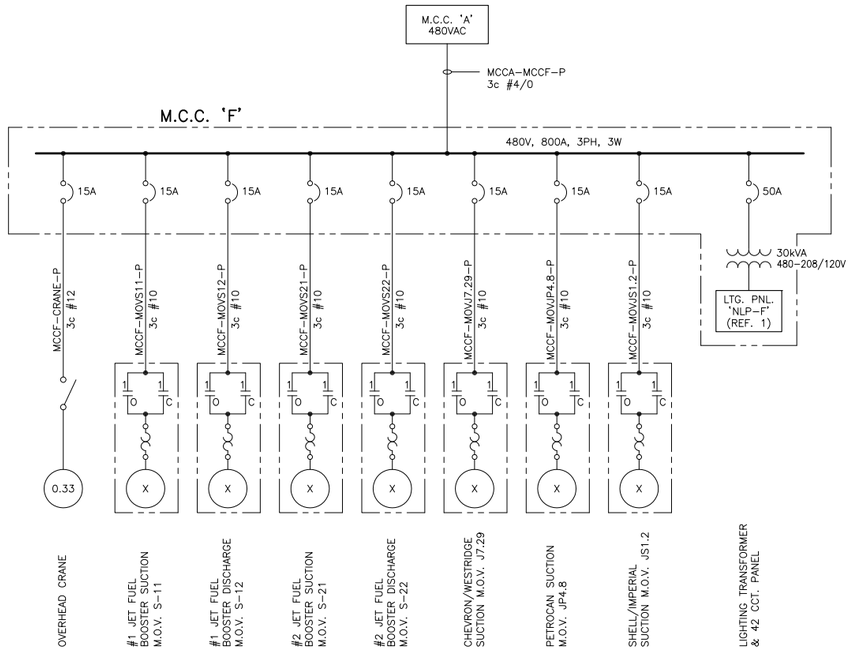
Number	Rev	Title
BB00-EE1020	4C	12.47 AND 4.16KV SLD LOWER TANK FARM AREA
BB00-EE1020D	A	DEMOLITION - 12.47 AND 4.16KV SLD LOWER TANK FARM AREA
01-13283-BB00-EE1028 SHT 1	8C	SINGLE LINE DIAGRAM MCC-DX IN MCC-D BLDGREFINED PRODUCTS
01-13283-BB00-EE01028 SHT 02	C	SINGLE LINE DIAGRAM 480 VOLT DISTRIBUTION MCC-DX (480V) TMEP
01-13283-BB00-EE01028 SHT 03	C	SINGLE LINE DIAGRAM 480 VOLT DISTRIBUTION MCC-DX (480V) TMEP
01-13343-C1A01-BB00-EE1033 SHT 2	2C	SINGLE LINE DIAGRAM TK85 MCC TANK 85
01-13277-C1A01-BB00-EE1034 SHT 2	1C	SINGLE LINE DIAGRAM TK71 MCC TANK 71
01-13283-BB00-EE1035 SHT 2	0C	SINGLE LINE DIAGRAM TK73
12887-C1A01-BB00-EE1038 SHT 2	1C	SINGLE LINE DIAGRAM TANK76
01-13343-C1A01-BB00-EE1039 SHT 2	4C	SINGLE LINE DIAGRAM TK72 MCC TANK 72
BB00-EE1319 SHT 1	0C	480V SINGLE LINE DIAGRAM LC-3 UPPER TANK FARM AREA
BB00-EE1320 SHT 1	0C	480V SINGLE LINE DIAGRAM LC-4 LOWER TANK FARM AREA
01-13283-BB00-EE01660 SHT 1	C	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM
01-13283-BB00-EE01660 SHT 2	C	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM
01-13283-BB00-EE01660 SHT 3	B	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM
01-13283-BB00-EE01660 SHT 4	B	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM
01-13283-BB00-EE01660 SHT 5	B	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM
01-13283-BB00-EE01661 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP
01-13283-BB00-EE01661 SHT 2	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP
01-13283-BB00-EE01661 SHT 3	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP
01-13283-BB00-EE01661 SHT 4	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP
01-13283-BB00-EE01661 SHT 5	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP

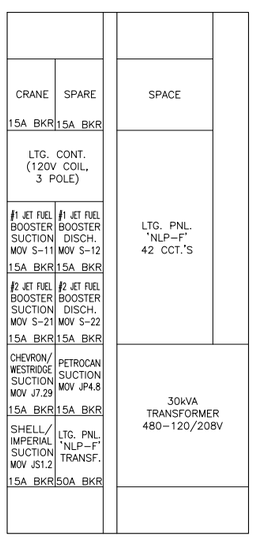
APPENDIX 4 – REFERENCE DRAWINGS

Number	Rev	Title
01-13283-BB00-EE01661 SHT 6	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP
01-13283-BB00-EE01662 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2-MCC TMEP
01-13283-BB00-EE01662 SHT 2	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2-MCC TMEP
01-13283-BB00-EE01662 SHT 3	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2-MCC TMEP
01-13283-BB00-EE01663 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01663 SHT 2	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01663 SHT 3	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01663 SHT 4	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01663 SHT 5	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01663 SHT 6	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01663 SHT 7	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP
01-13283-BB00-EE01664 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-LC3A-MCC TMEP
01-13283-BB00-EE01665 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-LC4A-MCC TMEP
01-13283-BB00-EE01666 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3-MCC TMEP
01-13283-BB00-EE01666 SHT 2	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3-MCC TMEP
01-13283-BB00-EE01666 SHT 3	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3A-MCC TMEP
01-13283-BB00-EE01666 SHT 4	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3A-MCC TMEP
01-13283-BB00-EE01666 SHT 5	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3B-MCC TMEP
01-13283-BB00-EE01666 SHT 6	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3B-MCC TMEP
01-13283-BB00-EE01667 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB4-MCC TMEP

APPENDIX 4 – REFERENCE DRAWINGS

Number	Rev	Title
01-13283-BB00-EE01667 SHT 2	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB4-MCC TMEP
01-13283-BB00-EE01668 SHT 1	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5-MCC TMEP
01-13283-BB00-EE01668 SHT 2	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5-MCC TMEP
01-13283-BB00-EE01668 SHT 3	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5A-MCC TMEP
01-13283-BB00-EE01668 SHT 4	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5A-MCC TMEP
01-13283-BB00-EE01668 SHT 5	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5B-MCC TMEP
01-13283-BB00-EE01668 SHT 6	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5B-MCC TMEP
01-13283-BB00-EE01668 SHT 7	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5C-MCC TMEP
01-13283-BB00-EE01668 SHT 8	C	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5C-MCC TMEP





M.C.C. 'F' NORTH ELEVATION

NO.	REFERENCE DRAWINGS	DRAWING NO.
3	ELECTRICAL KEY PLAN – AREA #6	EE1006
2	SINGLE LINE DIAG. – M.C.C. 'A'	EE1024
1	LIGHTING PANEL SCHEDULES (4 SHT.'s)	EE1051

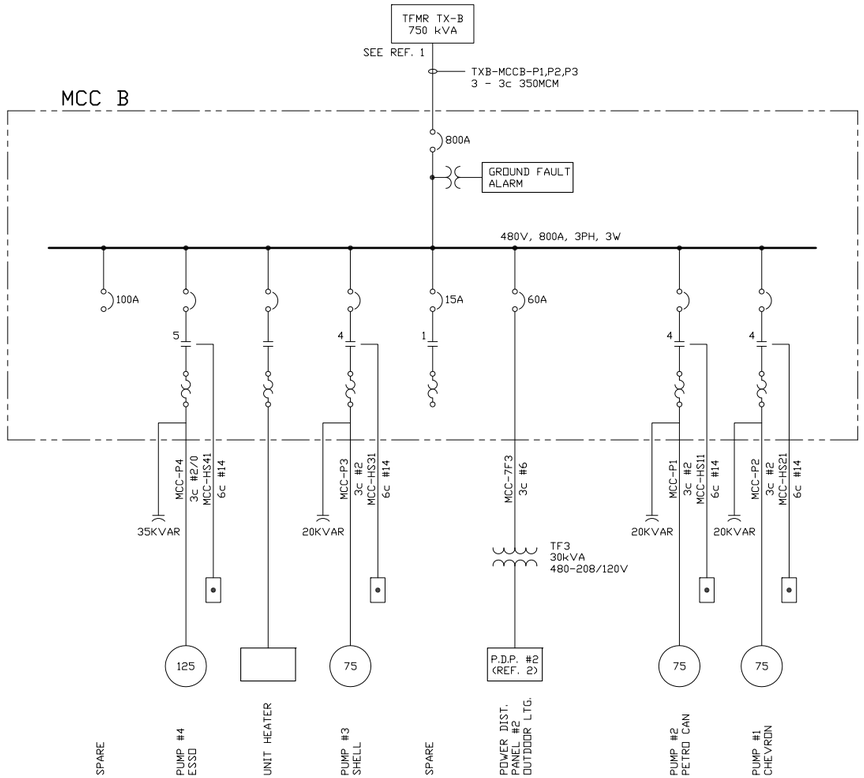
NO.	DATE	REVISION	DR.	CHK.	APPR.
0	98/10/30	AS BUILT JOB 7224 – JET FUEL PUMP	M.T.	J.N.	

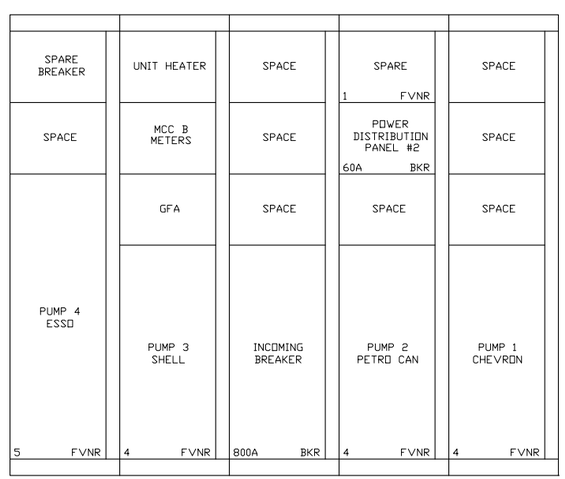
TRANS MOUNTAIN

DRAWN D.W.M.	480V SINGLE LINE DIAGRAM M.C.C. 'F' JET FUEL AREA	SHEET SIZE A1
CHECKED E.Z.		SCALE NONE
APPROVED	BURNABY TERMINAL	DATE 97/02/14

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	EE1023		0

SAVE NAME: CAD\BB00\EE1023 02-JUN-99 2:38 PM PLOT SCALE: 1:1





MCC B ELEVATION

NO.	REFERENCE DRAWINGS	DRAWING NO.
3	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015
2	LIGHTING PANEL SCHEDULES	EE1051 SHT.1/4
1	12.4kV & 4.16kV SINGLE LINE DIAGRAM	EE1020

NO.	DATE	REVISION	DR.	CHK.	APPR.
1	95/07/17	AS BUILT	BP		
0	94/05/17	REDRAWN FROM EE2004, REV.2	SM		

TRANS MOUNTAIN

DRAWN SM	480V SINGLE LINE DIAGRAM MCC B LOWER TANK FARM AREA BURNABY TERMINAL	SHEET SIZE A1
CHECKED		SCALE NONE
APPROVED		DATE 94/05/17

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1025		1

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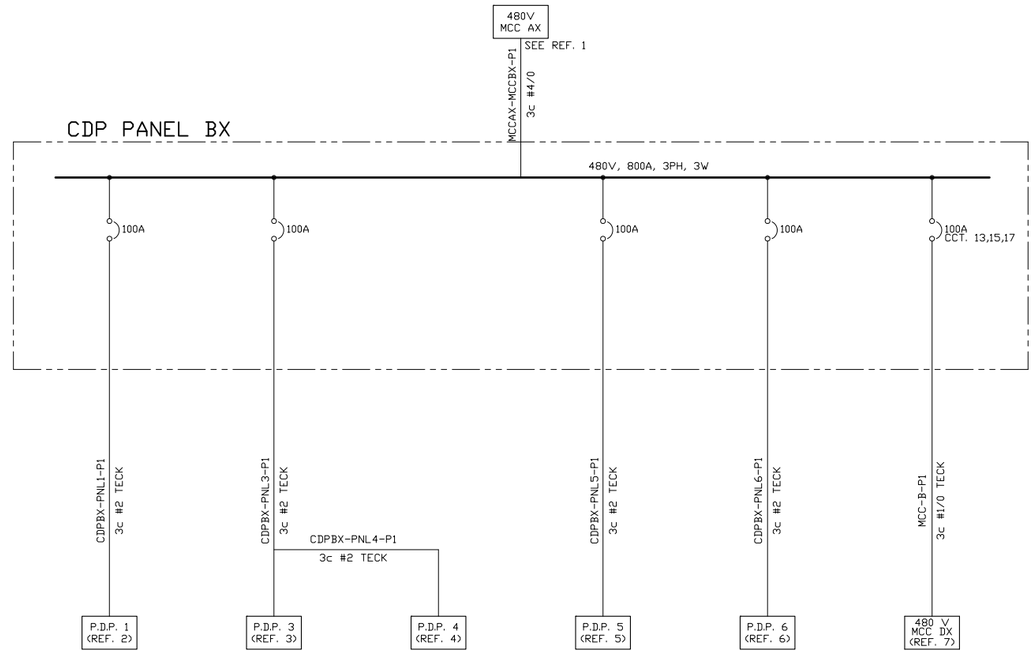

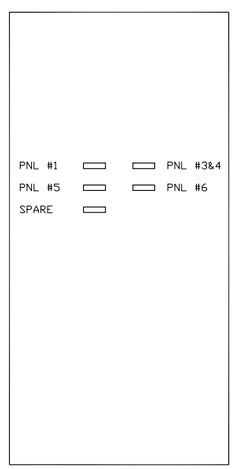

CDP PANEL BX ELEVATION

(LOCATED IN MCC 'B' BUILDING)

NO.	REFERENCE DRAWINGS	DRAWING NO.
8	DISTRIBUTION BLOCK DIAGRAM	EE1015
7	SINGLE LINE DIAGRAM MCC DX	EE1028
6	480V SINGLE LINE DIAGRAM P.D.P. 6	EE1045
5	480V SINGLE LINE DIAGRAM P.D.P. 5	EE1044
4	480V SINGLE LINE DIAGRAM P.D.P. 4	EE1043
3	480V SINGLE LINE DIAGRAM P.D.P. 3	EE1042
2	480V SINGLE LINE DIAGRAM P.D.P. 1	EE1041
1	480V SINGLE LINE DIAGRAM MCC AX	EE1026

NO.	DATE	REVISION	DR.	CHK.	APPR.
1	95/07/17	AS BUILT	BP		
0	94/05/18	REDRAWN FROM EE2006 REV.1	SM		

TRANS MOUNTAIN

DRAWN SM	480V SINGLE LINE DIAGRAM CDP PANEL BX LOWER TANK FARM AREA BURNABY TERMINAL	SHEET SIZE A1
CHECKED		SCALE NONE
APPROVED		DATE 94/05/18

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1027		1

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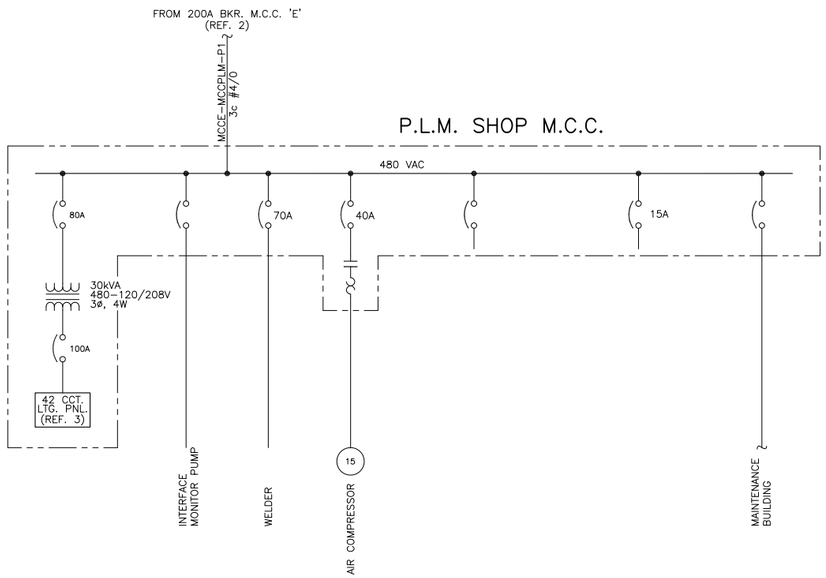
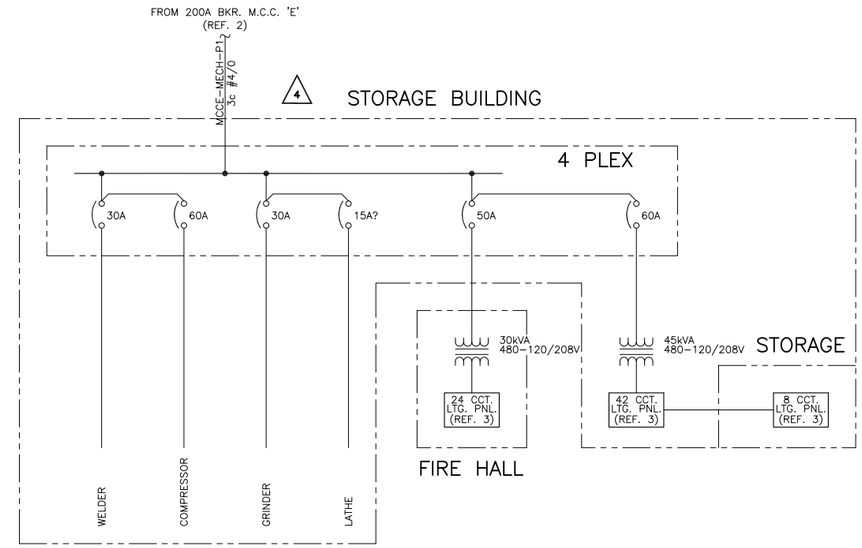
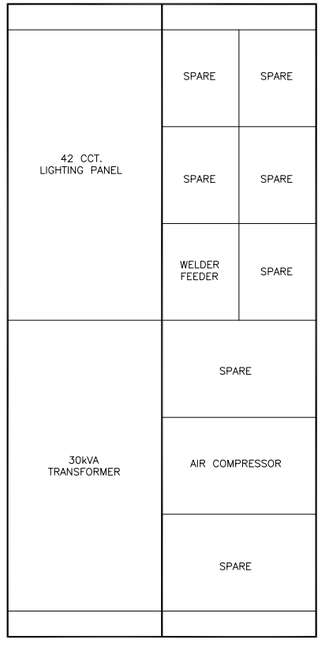
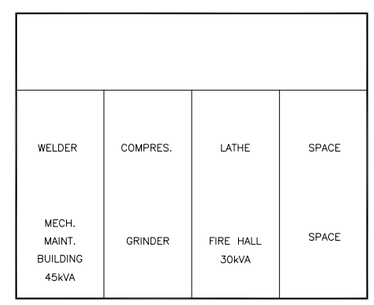






P.L.M. SHOP M.C.C. LAYOUT

N.T.S.



4 PLEX ENCLOSURE

N.T.S.

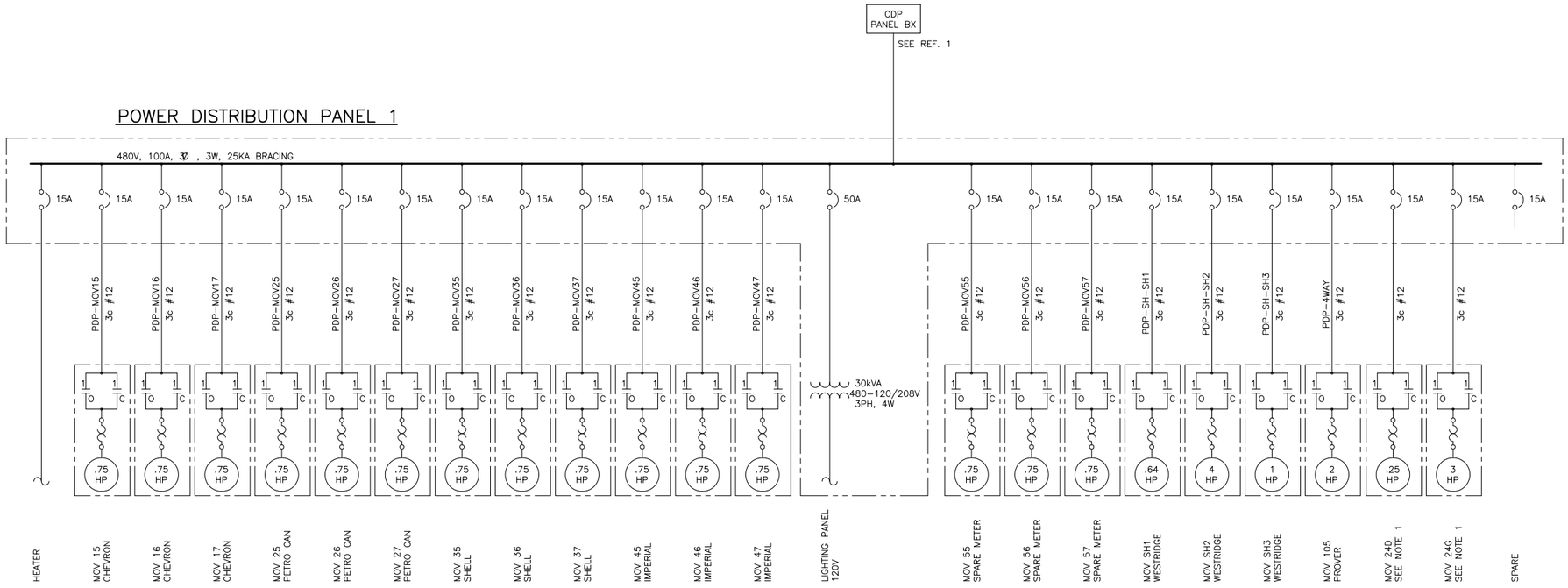
NO.	REFERENCE DRAWINGS	DRAWING NO.	NO.	DATE	REVISION	DR.	CHK.	APPR.	NO.	DATE	REVISION	DR.	CHK.	APPR.
									4	06/11/14	AS BUILT – FIELD REVIEW	LDP		
									3	99-01-13	GENERAL UPDATE – MCC LAYOUT REDRAWN	D.M.B.		
3	LTG. PNL. SCHED. – P.L.M. & MAINT. BLDG, FIRE HALL	EE1052							2	95-07-19	AS BUILT	B.P.		
2	480V SINGLE LINE DIAG. – MCC E/EX	EE1047							1	94-11-09	AS-BUILT – AFE 4126	T.L.		
1	SINGLE LINE DIAG. – OFFICE & MANIFOLD AREA	EE1014							0	94-05-18	REDRAWN FROM EE2009 REV. 1	G.J.P.		

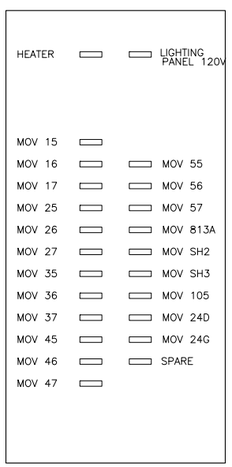
KINDER MORGAN CANADA INC.

TRANS MOUNTAIN

DRAWN	480V SINGLE LINE DIAGRAM P.L.M. SHOP AND MECHANICAL MAINTENANCE BLDG. BURNABY TERMINAL	SHEET SIZE A41
CHECKED		SCALE NONE
APPROVED		DATE 88-04-29

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
–	–	BB00	– EE1029		4





POWER DISTRIBUTION PANEL 1 ELEVATION

NOTES:

1. MOTORS 712B AND 712G HAVE A STALL TORQUE OF 40 ft-lb AND INRUSH CURRENT OF 24.5A (FROM NAMEPLATE DATA)

NO.	REFERENCE DRAWINGS	DRAWING NO.	NO.	DATE	REVISION	DR.	CHK.	APPR.
2	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015						
1	480V SINGLE LINE DIAG.CDP PANEL BX	EE1027						

NO.	DATE	REVISION	DR.	CHK.	APPR.
2	06/11/14	AS BUILT – FIELD REVIEW	LDP		
1	95/07/19	AS BUILT	BP		
0	94/05/24	REDRAWN FROM EE2007 SHT. 1 OF 5 REV. 1	MM		

KINDER MORGAN CANADA INC.

TRANS MOUNTAIN

DRAWN MHM

CHECKED

APPROVED

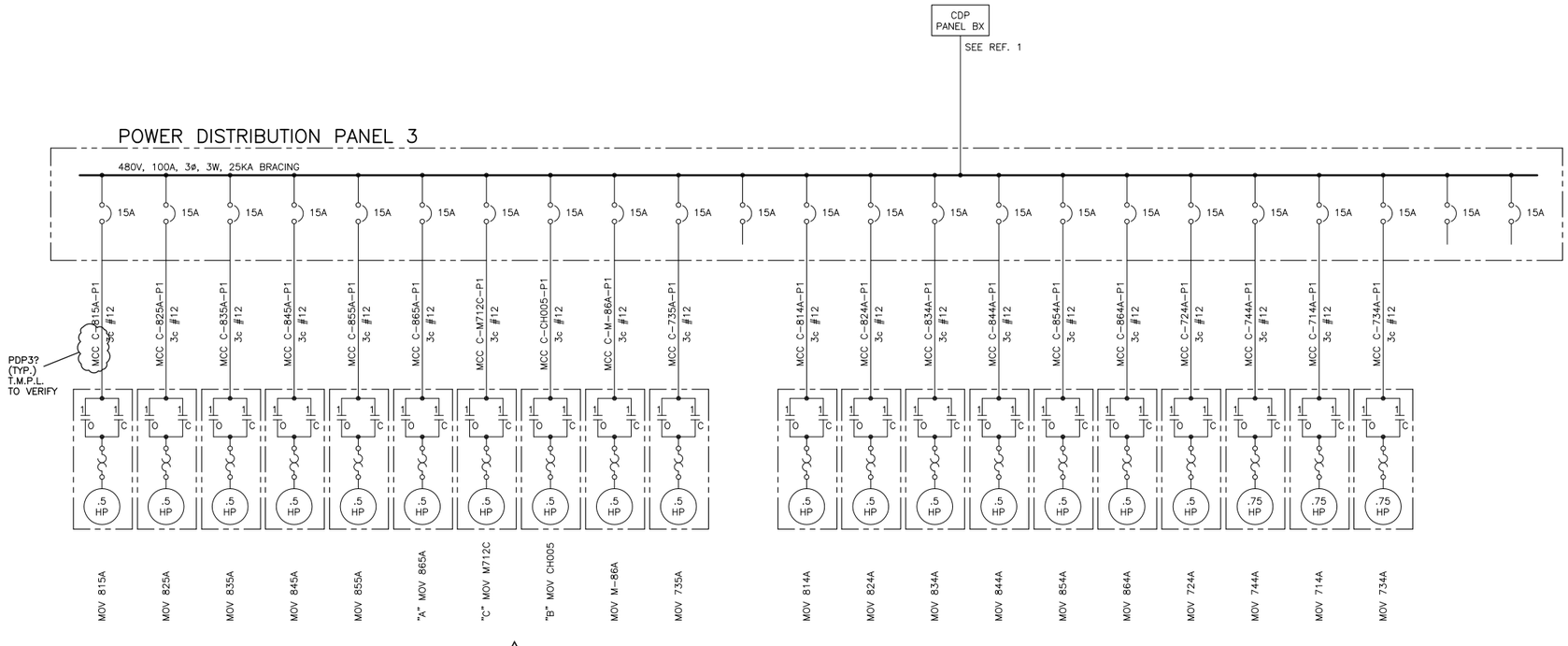
480V SINGLE LINE DIAGRAM
POWER DISTRIBUTION
MCC B PANEL 1
LOWER TANK FARM AREA
BURNABY TERMINAL

SHEET SIZE AA1

SCALE N.T.S.

DATE 94/05/24

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1041		2



POWER DISTRIBUTION PANEL 3 ELEVATION

NO.	REFERENCE DRAWINGS	DRAWING NO.
2	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015
1	480V SINGLE LINE DIAG. CDP PANEL BX	EE1027

NO.	DATE	REVISION	DR.	CHK.	APPR.
2	06/11/14	AS BUILT – FIELD REVIEW	LDP		
1	95/07/20	AS BUILT	BP		
0	94/05/24	REDRAWN FROM EE2007, SHT. 2 OF 5 REV.4	SM		

KINDER MORGAN CANADA INC.

TRANS MOUNTAIN

DRAWN SM

CHECKED

APPROVED

480V SINGLE LINE DIAGRAM
POWER DISTRIBUTION
MCC B PANEL 3
LOWER TANK FARM
BURNABY TERMINAL

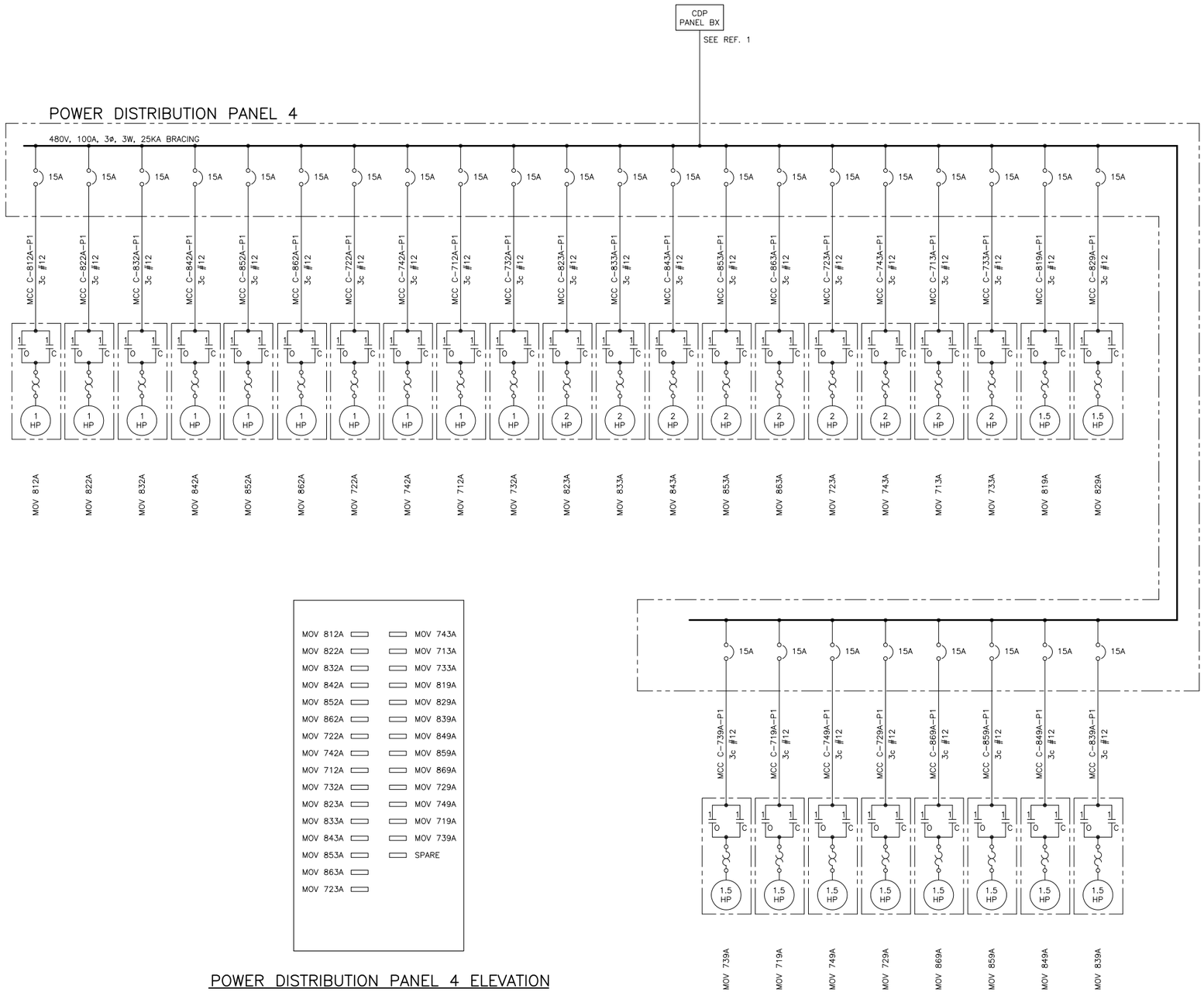
SHEET SIZE A41

SCALE NONE

DATE 94/05/24

DRAWING NUMBER

AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1042		2



MOV 812A	MOV 743A
MOV 822A	MOV 713A
MOV 832A	MOV 733A
MOV 842A	MOV 819A
MOV 852A	MOV 829A
MOV 862A	MOV 839A
MOV 722A	MOV 849A
MOV 742A	MOV 859A
MOV 712A	MOV 869A
MOV 732A	MOV 729A
MOV 823A	MOV 749A
MOV 833A	MOV 719A
MOV 843A	MOV 739A
MOV 853A	SPARE
MOV 863A	
MOV 723A	

POWER DISTRIBUTION PANEL 4 ELEVATION

NO.	REFERENCE DRAWINGS	DRAWING NO.
2	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015
1	480V SINGLE LINE DIAG. CDP PANEL BX	EE1027

NO.	DATE	REVISION	DR.	CHK.	APPR.
2	06/11/14	AS BUILT – FIELD REVIEW	LDP		
1	95/07/27	AS BUILT	BP		
0	94/05/24	REDRAWN FROM EE2007 SHT. 3 OF 5 REV. 1	MM		

KINDER MORGAN CANADA INC

TRANS MOUNTAIN

DRAWN MHM

CHECKED

APPROVED

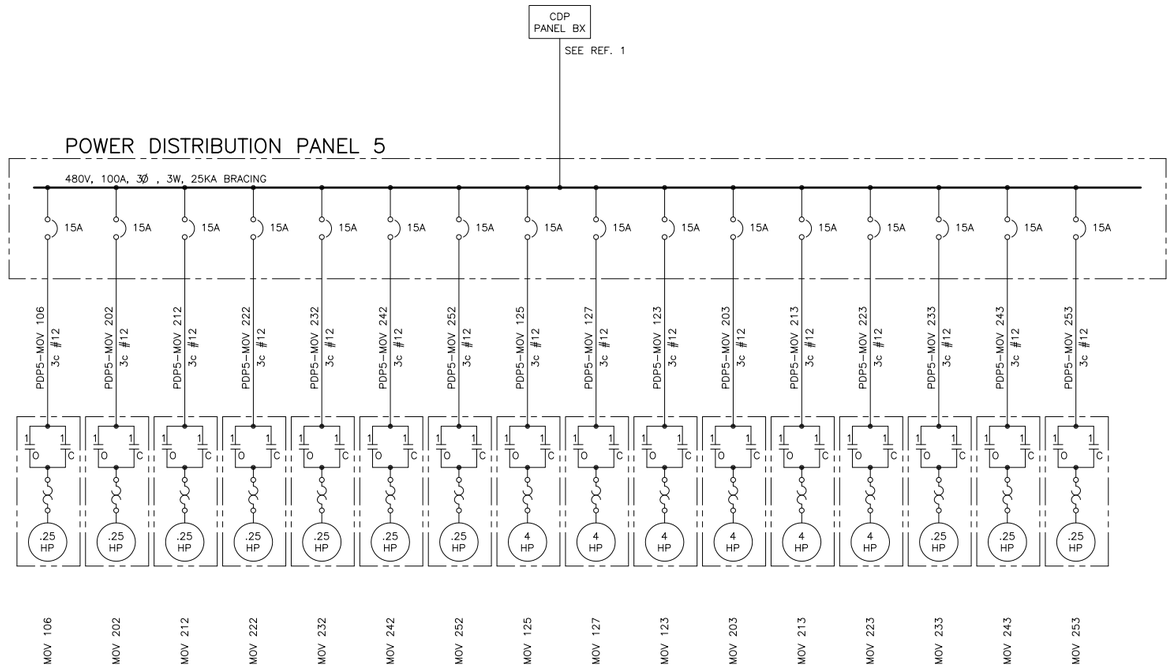
480V SINGLE LINE DIAGRAM
POWER DISTRIBUTION
MCC B PANEL 4
LOWER TANK FARM AREA
BURNABY TERMINAL

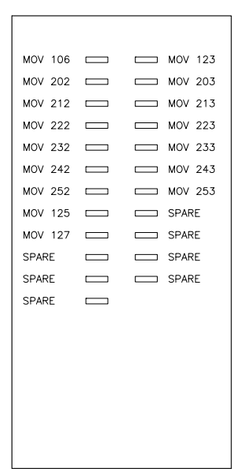
SHEET SIZE A1

SCALE N.T.S.

DATE 94/05/24

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1043		2





POWER DISTRIBUTION PANEL 5 ELEVATION

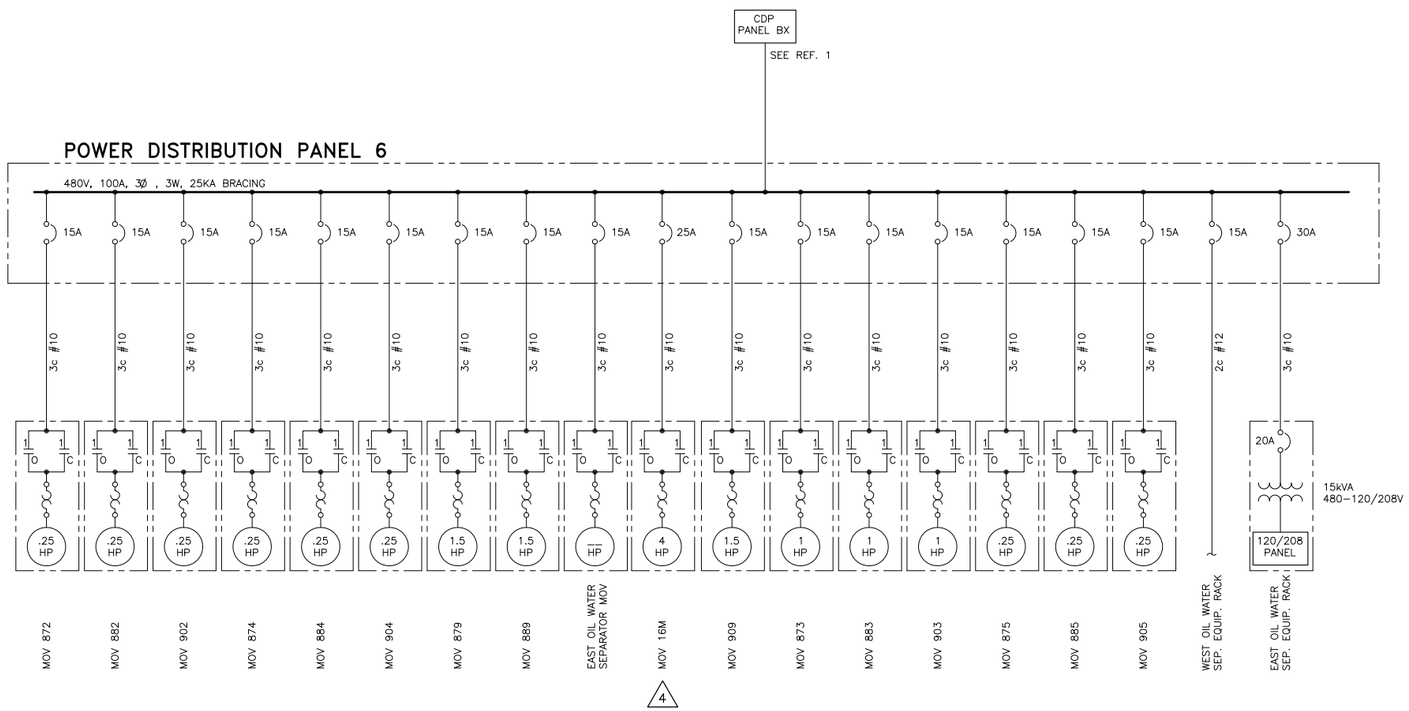
NO.	REFERENCE DRAWINGS	DRAWING NO.	NO.	DATE	REVISION	DR.	CHK.	APPR.	NO.	DATE	REVISION	DR.	CHK.	APPR.
2	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015							1	06/11/14	AS BUILT – FIELD REVIEW	LDP		
1	480V SINGLE LINE DIAG. CDP PANEL BX	EE1027							0	94/05/24	REDRAWN FROM EE2007, SHT. 4 OF 5 REV.1	SM		

KINDER MORGAN CANADA INC.

TRANS MOUNTAIN

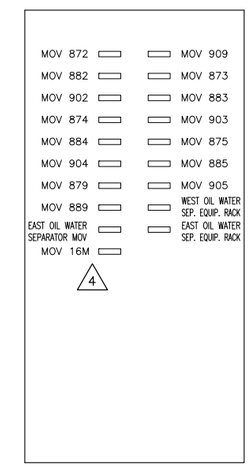
DRAWN SM	480V SINGLE LINE DIAGRAM POWER DISTRIBUTION MCC B PANEL 5 LOWER TANK FARM AREA BURNABY TERMINAL	SHEET SIZE A41
CHECKED		SCALE NONE
APPROVED		DATE 94/05/24

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1044		1



NOTES:

1. MOV NUMBERS IN THE MANIFOLD AREA ARE THE SAME AS THE NUMBERS AT THE BREAKER PANELS BUT ARE PRECEDED BY THE NUMBER '3' EG. THE BREAKER NUMBER 872 BECOMES 3872 AT THE MOV AND 882 BECOMES 3882 ETC.



POWER DISTRIBUTION PANEL 6 FRONT ELEVATION

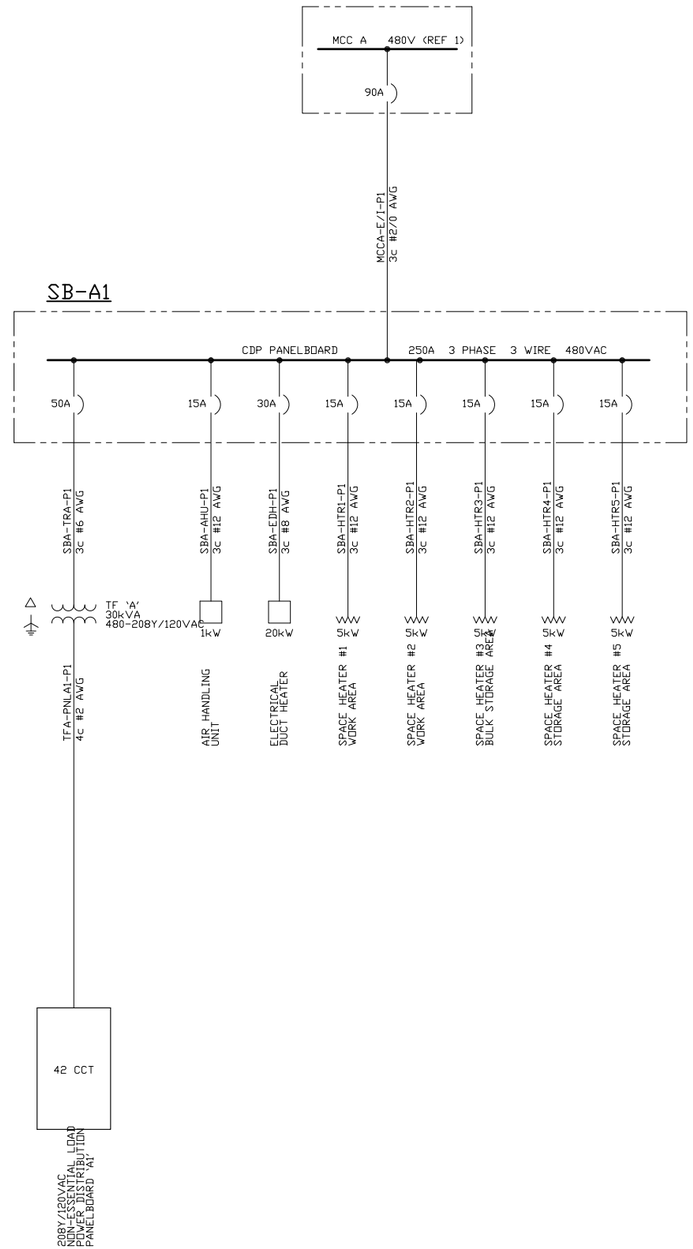
NO	REFERENCE DRAWINGS	DRAWING NO
2	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015
1	480V SINGLE LINE DIAG. CDP PANEL BX	EE1027

NO	DATE	REVISION	DRN	CHK	APPR
4	12/03/09	AS BUILT, AFE 01–12912 (FE 211021.01)	MR	BR	
3	11/09/26	ISSUED FOR CONSTRUCTION, AFE 01–12912 (FE 211021.01)	KCh	PR	
2	11/05/25	AS BUILT PER FMR #10360 (C/W FIELD VERIFICATION)	LDP	BDC	
1	06/11/14	AS BUILT – FIELD REVIEW	LDP		
0	94/05/24	REDRAWN FROM EE2007 SHT. 5 OF 5 REV. 2	MM		

KINDER MORGAN CANADA — TRANS MOUNTAIN

DRAWN BY MHM	SINGLE LINE DIAGRAM POWER DISTRIBUTION PANEL 6 (480V) IN MCC–B BLDG	SHEET SIZE A1
CHECKED BY		SCALE N.T.S.
APPROVED BY	BURNABY TERMINAL	DATE 94/05/24

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
—	—	BB00	EE1045		4



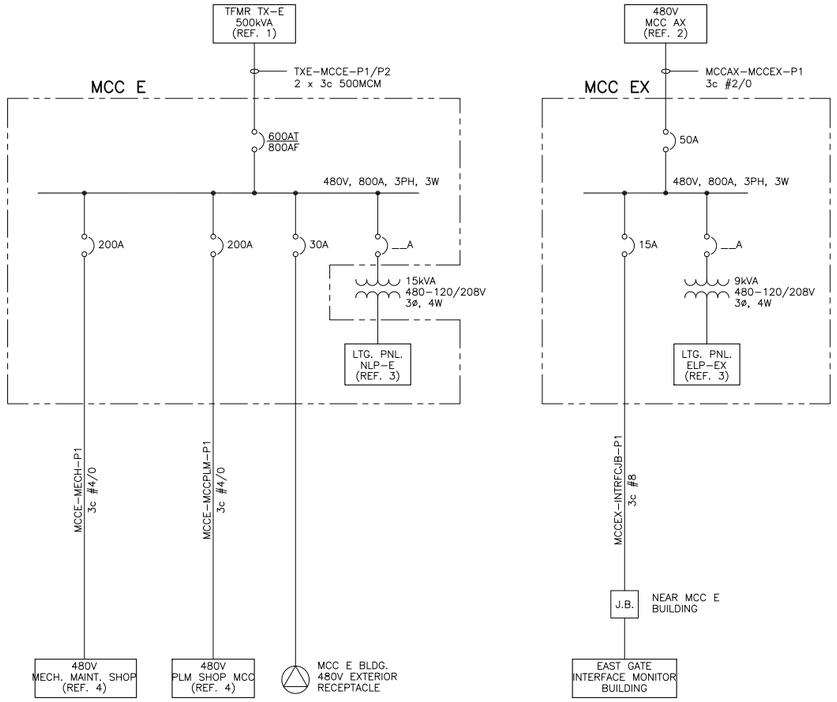
NO.	REFERENCE DRAWINGS	DRAWING NO.	NO.	DATE	REVISION	DR.	CHK.	APPR.	NO.	DATE	REVISION	DR.	CHK.	APPR.
2	KEY PLAN DISTRIBUTION BLOCK DIAGRAM	EE1015							1	95/07/20	AS BUILT	BP		
1	480V SINGLE LINE DIAGRAM MCC-A	EE1024							0	94/05/24	REDRAWN FROM EE2016, REV.1	SM		

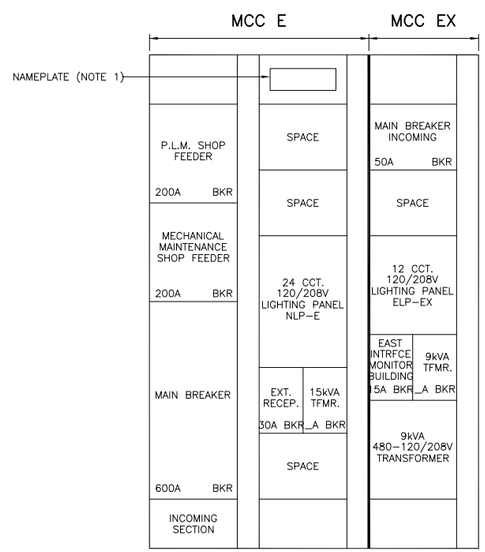
TRANS MOUNTAIN

DRAWN SM	480V SINGLE LINE DIAGRAM CDP PANELBOARD SB-A1 E/I BUILDING BURNABY TERMINAL	SHEET SIZE A1
CHECKED		SCALE NONE
APPROVED		DATE 94/25/24

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1046		1

SAVE NAME: CAD\BB00\E\EE1046 20-JUL-95 11:58 AM PLOT SCALE: 1:1





MCC E & MCC EX ELEVATION

WARNING

THIS MCC LINE-UP IS SUPPLIED BY TWO SEPARATE SOURCES OF POWER. DISCONNECT BOTH POWER SOURCES BEFORE WORKING ON MCC.

NO.	REFERENCE DRAWINGS	DRAWING NO.
5	ELECTRICAL KEY PLAN	EE1000
4	480V SINGLE LINE DIAGRAM – P.L.M.	EE1029
3	LIGHTING PANEL SCHEDULES	EE1051 (4 SHT'S)
2	480V SINGLE LINE DIAGRAM – MCC AX	EE1026
1	12.47kV & 4.16kV SINGLE LINE DIAGRAM	EE1020

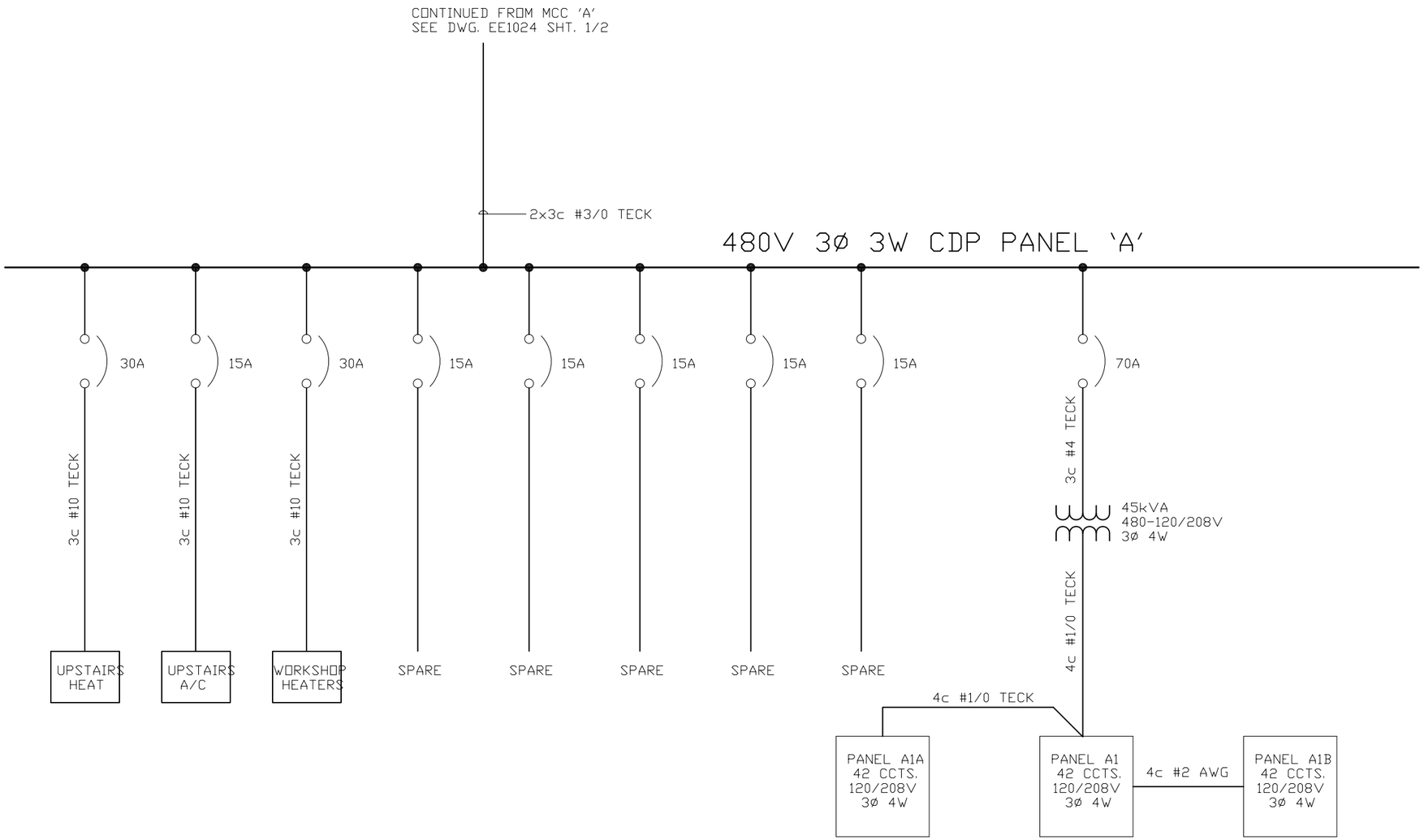
NO.	DATE	REVISION	DR.	CHK.	APPR.
1	95-07-20	AS BUILT	B.P.		
0	94-11-09	AS-BUILT – AFE 4126	T.L.	M.L.	

TRANS MOUNTAIN

DRAWN D.W.M.	480V SINGLE LINE DIAGRAM MCC 'E' & MCC 'EX'	SHEET SIZE A1
CHECKED M.L.		SCALE NONE
APPROVED	BURNABY TERMINAL	DATE 94-05-20

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	EE1047		1

SAVE NAME: CAD\BB00\EE1047 25-JUL-95 2:25 PM PLOT SCALE: 1:1



NO.	REFERENCE DRAWINGS	DRAWING NO.
2	LIGHTING PANEL SCHEDULES	EE1313
1	SINGLE LINE DIAGRAM – MCC A	EE1024 (2 SHEETS)

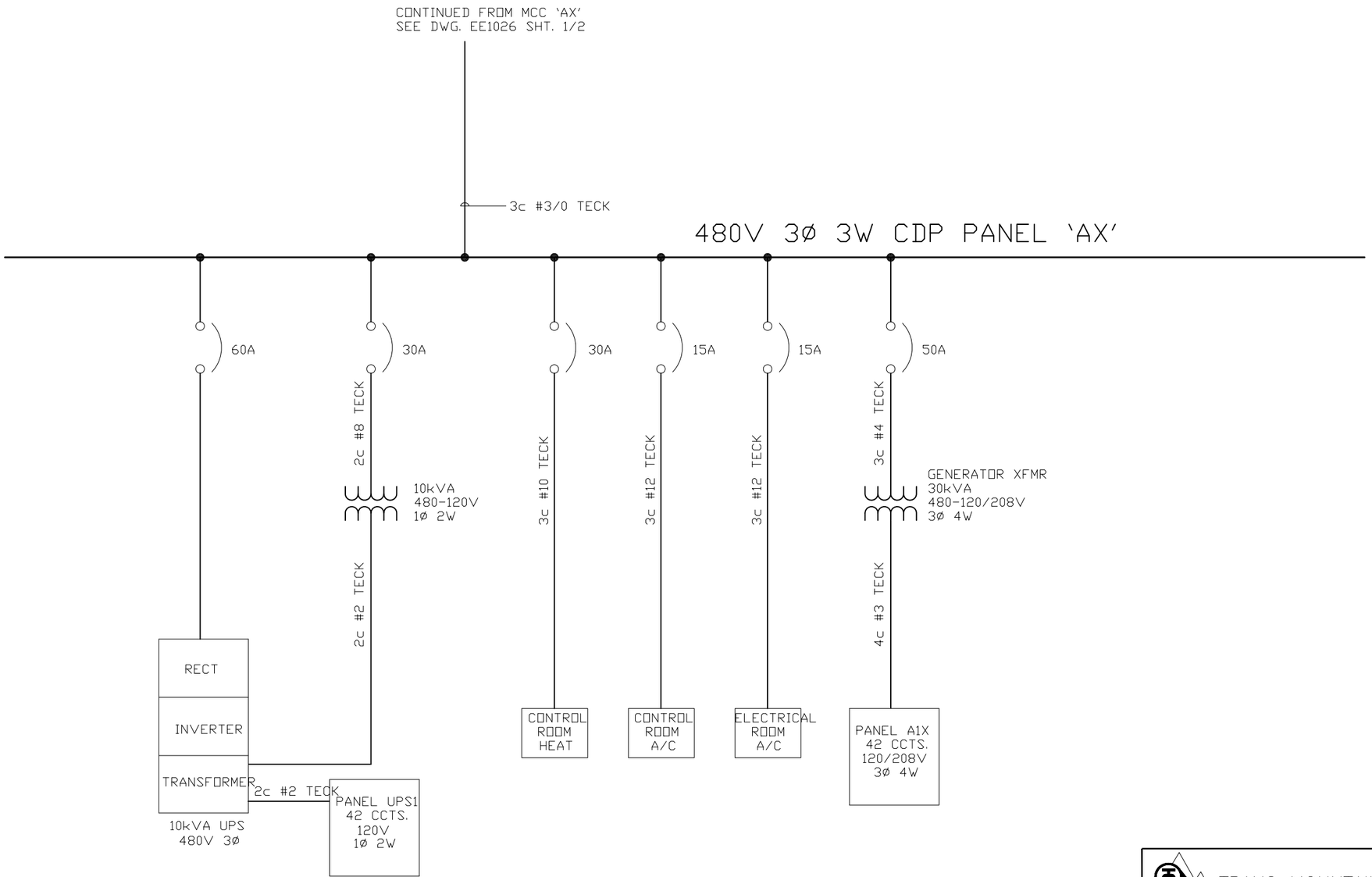
NO.	DATE	REVISION	DR.	CHK.
0	98/09/28	AS BUILT JOB 7155 – CONTROL BUILDING : REDRAWN	DA	AAW

TRANS MOUNTAIN

DRAWN DA	SINGLE LINE DIAGRAM CDP PANEL "A" CONTROL ROOM BUILDING	SHEET SIZE A3
CHECKED AAW		SCALE 1:1
APPROVED	BURNABY TERMINAL	DATE 98/09/28

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1311		0

SAVE NAME: CAD\BB00\E\EE1311 08-APR-99 1:32 PM PLOT SCALE: 1:1



NO.	REFERENCE DRAWINGS	DRAWING NO.
2	LIGHTING PANEL SCHEDULES	EE1313
1	SINGLE LINE DIAGRAM – MCC AX	EE1026 (2 SHEETS)

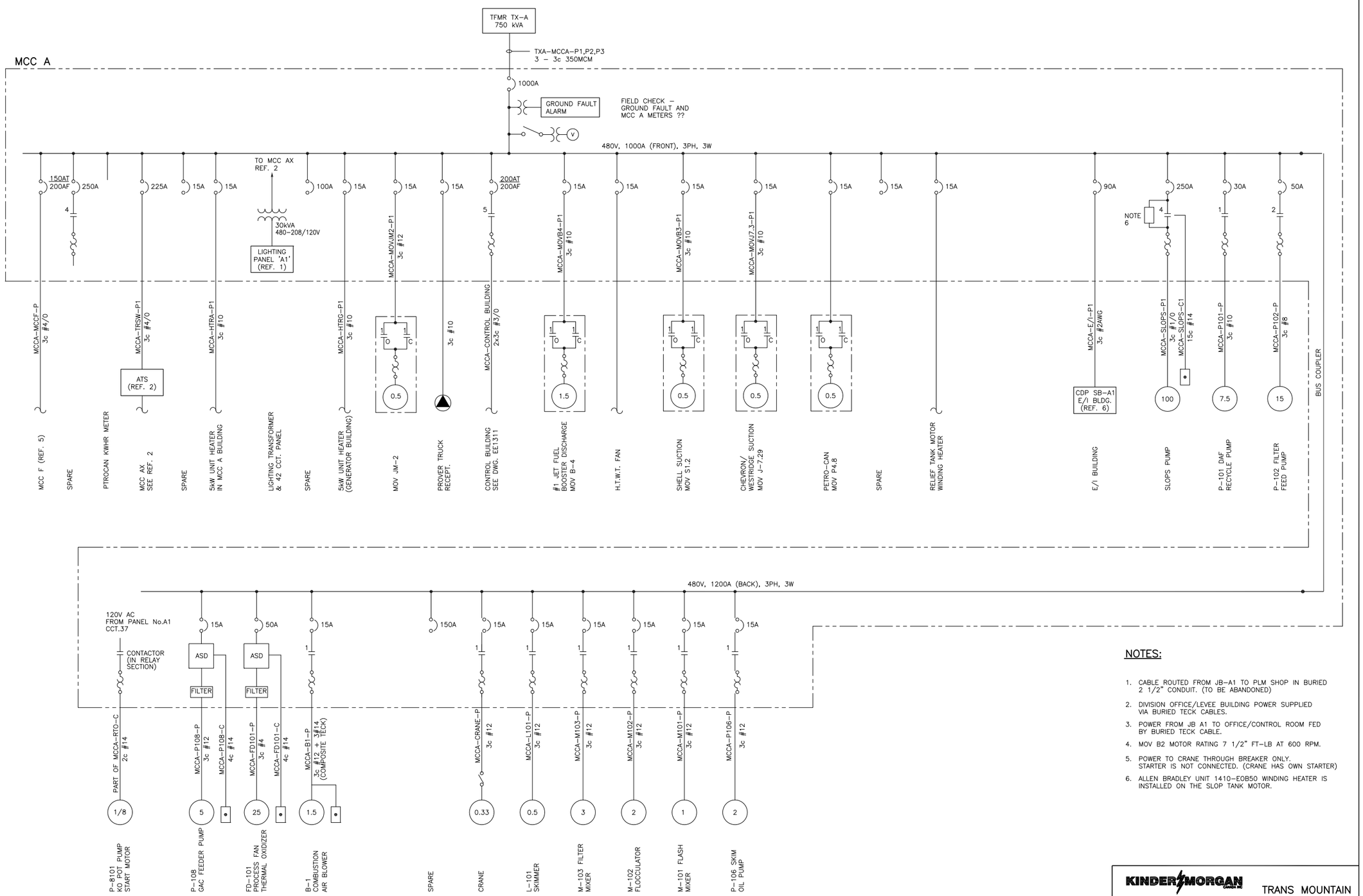
NO.	DATE	REVISION	DR.	CHK.
0	98/09/28	AS BUILT JOB 7155 – CONTROL BUILDING : REDRAWN	DA	AAW

TRANS MOUNTAIN

DRAWN DA	SINGLE LINE DIAGRAM CDP PANEL "AX" GENERATOR POWER CONTROL ROOM BURNABY TERMINAL	SHEET SIZE A3
CHECKED AAW		SCALE 1:1
APPROVED		DATE 98/09/28

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1312		0

SAVE NAME: CAD\BB00\E\EE1312 27-JAN-99 3:29 PM PLOT SCALE: 1:1



NOTES:

1. CABLE ROUTED FROM JB-A1 TO PLM SHOP IN BURIED 2 1/2" CONDUIT. (TO BE ABANDONED)
2. DIVISION OFFICE/LEVEE BUILDING POWER SUPPLIED VIA BURIED TECK CABLES.
3. POWER FROM JB A1 TO OFFICE/CONTROL ROOM FED BY BURIED TECK CABLE.
4. MOV B2 MOTOR RATING 7 1/2" FT-LB AT 600 RPM.
5. POWER TO CRANE THROUGH BREAKER ONLY. STARTER IS NOT CONNECTED. (CRANE HAS OWN STARTER)
6. ALLEN BRADLEY UNIT 1410-EOB50 WINDING HEATER IS INSTALLED ON THE SLOP TANK MOTOR.

NO.	REFERENCE DRAWINGS	DRAWING NO.	NO.	DATE	REVISION	DR.	CHK.	APPR.
5	480V SINGLE LINE DIAGRAM - MCC-F	EE1023						
4	SINGLE LINE DIAGRAM-CDP PANEL A	EE1311						
3	DISTRIBUTION BLOCK DIAG.	EE1015	8	06/11/14	AS BUILT - FIELD REVIEW	LDP		
2	480V SINGLE LINE DIAGRAM - MCC AX	EE1026	7	00/04/10	AS BUILT AFE 8273 - HYDROSTATIC TEST WATER TREATMENT FACILITY UOGRADE	DMB	AAW	
1	LIGHTING PANEL SCHEDULES (4 SHT.'s)	EE1051	6	98/09/28	AS BUILT JOB 7155 - CONTROL BUILDING	DA	AAW	

NO.	DATE	REVISION	DR.	CHK.	APPR.
5	97-10-22	AS-BUILT 4174-C1A01 HYDRO TEST WATER TREATMENT - MADE INTO 2 SHTS	DAW		KWS
4	96/04/25	GENERAL FIELD UPDATE APRIL 1996	E.L.M.		
3	96/03/15	GENERAL REVISION	DA		
2	95/07/17	AS-BUILT	B.P.		
1	94/11/09	AS-BUILT (AFE 4126)	T.L.		
0	94/05/17	REDRAWN FROM EE2001, REV.7	G.P.	B.M.	

KINDER MORGAN CANADA INC.

TRANS MOUNTAIN

DRAWN G.P.
CHECKED C.W.
APPROVED

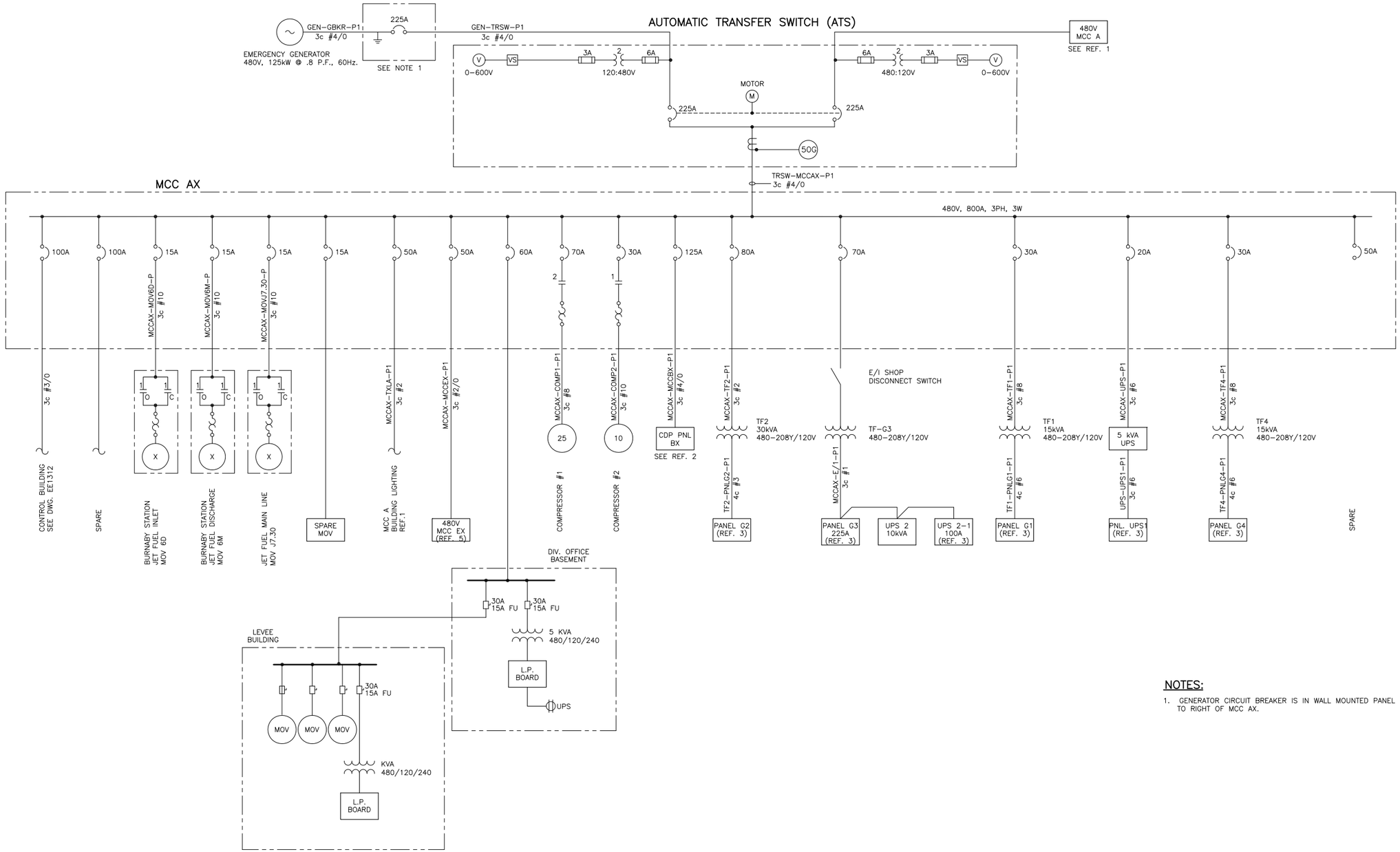
480V - MCC 'A'
SINGLE LINE DIAGRAM
LOWER TANK FARM AREA

BURNABY TERMINAL

SHEET SIZE A41
SCALE NONE
DATE 91/02/11

DRAWING NUMBER

AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	EE1024	1/2	8



NOTES:

1. GENERATOR CIRCUIT BREAKER IS IN WALL MOUNTED PANEL TO RIGHT OF MCC AX.

NO.	REFERENCE DRAWINGS	DRAWING NO.
7	SINGLE LINE DIAGRAM – CDP PANEL AX	EE1312
6	480V MCC AX ELEVATION	EE1026 2/2
5	480V SINGLE LINE DIAG. – MCC E/EX	EE1047
4	PARTIAL PLOT PLAN & DIST. BLK. DIAG.	EE1015
3	LIGHTING PANEL SCHEDULES (4 SHT.'s)	EE1051
2	480V SINGLE LINE DIAG. – CDP PNL. BX	EE1027
1	480V SINGLE LINE DIAGRAM – MCC A	EE1024

NO.	DATE	REVISION	DR.	CHK.	APPR.
5	98/09/28	AS BUILT JOB 7155 – CONTROL BUILDING	DA	AAW	
4	97-01-23	AS-BUILT, JOB NO. 6141 – ELECTRICAL TERMINATION BUILDING	ELM		
3	96-04-25	GENERAL FIELD UPDATE APRIL 1996	ELM		
2	95-07-26	AS-BUILT	B.P.		
1	94-11-09	AS-BUILT – AFE 4126	T.L.		
0	94-05-17	REDRAWN FROM EE2005 REV.2	S.M.		

TRANS MOUNTAIN

DRAWN G.P.
CHECKED G.W.
APPROVED

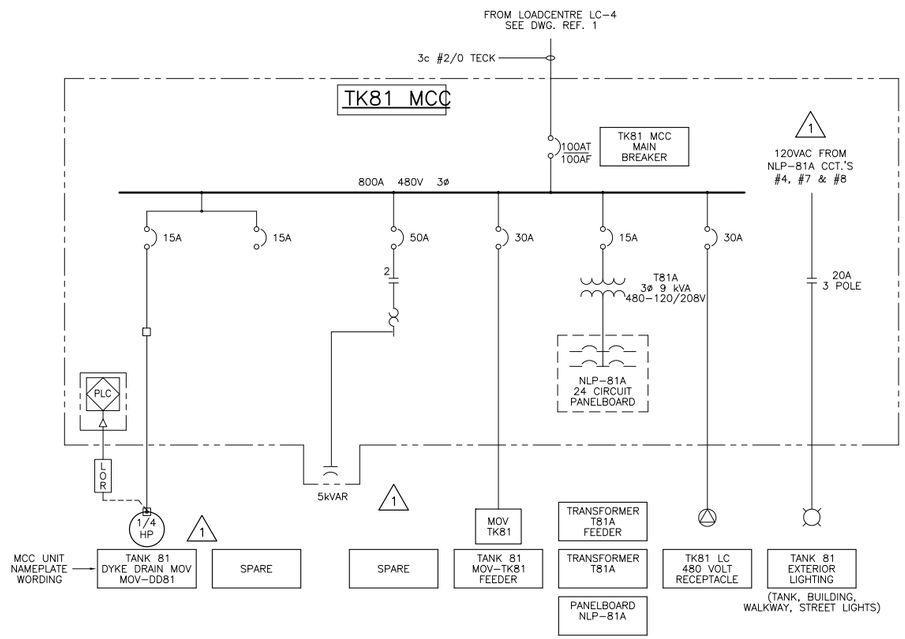
480V – MCC 'AX'
SINGLE LINE DIAGRAM
LOWER TANK FARM AREA

BURNABY TERMINAL

SHEET SIZE A1
SCALE NONE
DATE 91-02-11

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	EE1026	1	5

SAVE NAME: CAD\BB00\EE102601 29-MAR-99 9:29 AM PLOT SCALE: 1:1.000



TK81 MCC POWER DISTRIBUTION

NOTES: 1

1. MCC UNIT INCLUDES EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.

NO	REFERENCE DRAWINGS	DRAWING NO
5	NLP-81A LIGHTING PANEL SCHEDULE	EE1472
4	MOV-DD81 SCHEMATIC & WIRING	EE1463
3	TANK 81 EXTERIOR LIGHTING SCHEMATIC & WIRING	EE1154
2	MOV-TK81 SCHEMATIC & WIRING	EE1153
1	PUMPHOUSE & TANK AREA SINGLE LINE DIAGRAM	EE1021

NO	DATE	REVISION	DRN	CHK	APPR
1	14/02/28	AS BUILT, AFE 01-13279	DWM	FA	
0	13/03/25	ISSUED FOR CONSTRUCTION, AFE 01-13279 (FE 212269.01)	KCh	FA	

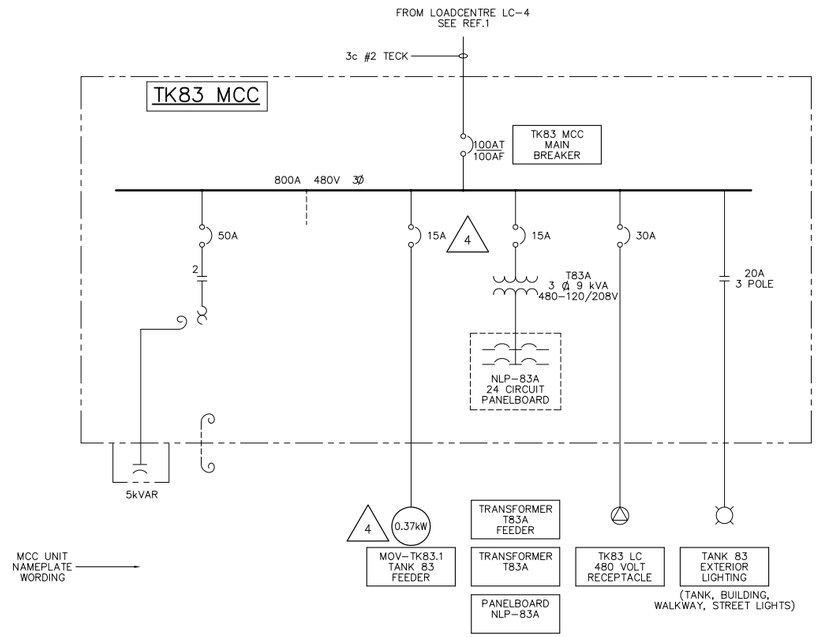
KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY DWM	SINGLE LINE DIAGRAM TK81 MCC TANK 81	SHEET SIZE A1
CHECKED BY FA		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/03/14

DRAWING NUMBER

AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13279	C1A01	BB00	EE1031	2	1



NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.
2. EXTRACTED FROM DRAWING BB00-EE1032.

NO	REFERENCE DRAWINGS	DRAWING NO
7	SCHEMATIC DIAGRAM MOV TK83 TANK 83 BAY	EE115001
6	NLP-83A PANEL BOARD SCHEDULE	EE1032 SHEET 3
5	TK83 MCC ELEVATION	EE1032 SHEET 1
4	LIGHTING CONTACTOR WIRING	EE1151
3	MOV STARTER WIRING	EE1150
2	MIXER STARTER WIRING	EE1149
1	S.L.D. PUMPHOUSE & TANK AREA	EE1021

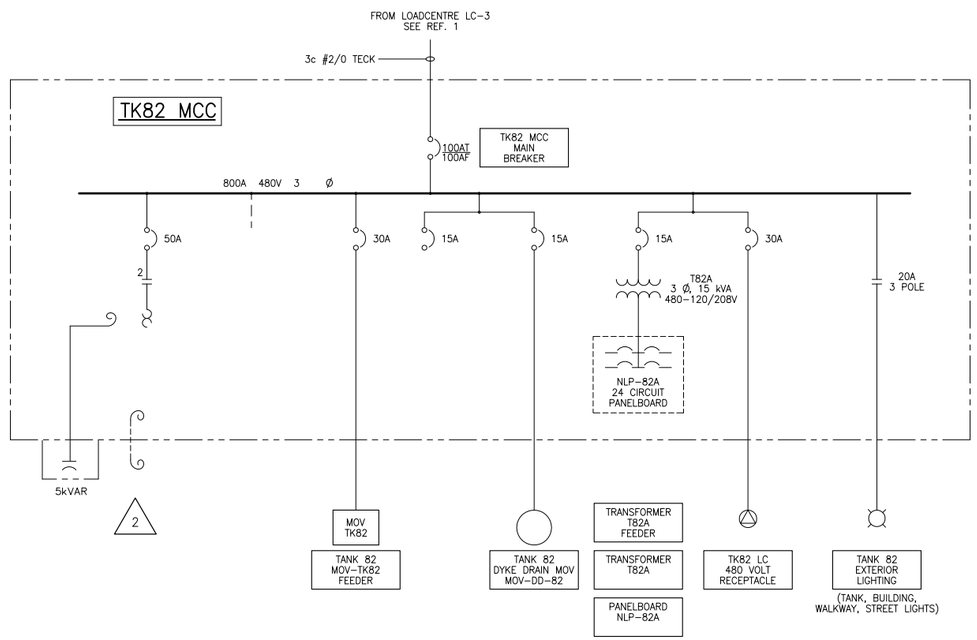
NO	DATE	REVISION	DRN	CHK	APPR
4	16/02/08	AS BUILT, AFE #01-13548	RLY	SA	GRL
3	15/07/23	ISSUED FOR CONSTRUCTION, AFE #01-13548	LGC	SA	GRL
2	14/01/21	AS BUILT, AFE 01-13343	JJK	GL	
1	13/12/18	AS BUILT, AFE 01-13343	KCh	LS	
0	13/08/29	ISSUED FOR CONSTRUCTION, AFE 01-13343 (FE 213131)	KCh	LS	

KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY MHM	SINGLE LINE DIAGRAM 480V TK83 MCC TK83 LC BUILDING	SHEET SIZE A1
CHECKED BY		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/08/29

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13343	C1A01	BB00	EE1032 (FORMERLY EE1032)	2	4



NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.
2. EXTRACTED FROM DRAWING BB00-EE1036.

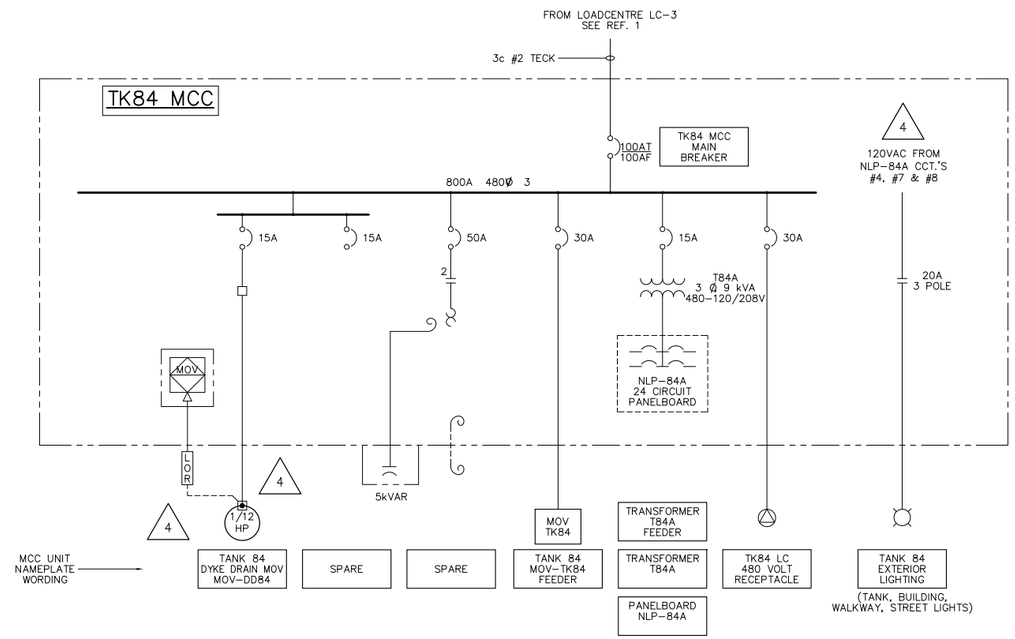
NO	REFERENCE DRAWINGS	DRAWING NO
6	NLP-82A PANEL BOARD SCHEDULE	EE1036 SHEET 3
5	TK82 MCC ELEVATION	EE1036 SHEET 1
4	LIGHTING CONTACTOR WIRING	EE1108
3	MOV STARTER WIRING	EE1107
2	MIXER STARTER WIRING	EE1106
1	S.L.D. PUMPHOUSE & TANK AREA	EE1021

NO	DATE	REVISION	DRN	CHK	APPR
2	14/01/21	AS BUILT, AFE 01-13343	JJK	GL	
1	13/12/18	AS BUILT, AFE 01-13343	KCh	LS	
0	13/08/29	ISSUED FOR CONSTRUCTION, AFE 01-13343 (FE 213131)	KCh	LS	

KINDER MORGAN CANADA

DRAWN BY MHM	SINGLE LINE DIAGRAM TK82 MCC TANK 82	SHEET SIZE A1
CHECKED BY		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/08/29

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13343	C1A01	BB00	EE1036	2	2



NOTES: 4

1. MCC UNIT INCLUDES EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.
2. EXTRACTED FROM DRAWING BB00-EE1037.

NO	REFERENCE DRAWINGS	DRAWING NO
6	NLP-84A PANEL BOARD SCHEDULE	EE1037 SHEET 3
5	TK84 MCC ELEVATION	EE1037 SHEET 1
4	LIGHTING CONTACTOR WIRING	EE1111
3	MOV STARTER WIRING	EE1110
2	MIXER STARTER WIRING	EE1109
1	S.L.D. PUMPHOUSE & TANK AREA	EE1021

NO	DATE	REVISION	DRN	CHK	APPR
4	15/04/10	AS BUILT, AFE 01-13577	MR	KS	
3	14/05/30	ISSUED FOR CONSTRUCTION, AFE 01-13577 (TT 214018.00)	MR	FA	
2	14/01/21	AS BUILT, AFE 01-13343	JJK	GL	
1	13/12/18	AS BUILT, AFE 01-13343	KCh	LS	
0	13/08/29	ISSUED FOR CONSTRUCTION, AFE 01-13343 (FE 213131)	KCh	LS	

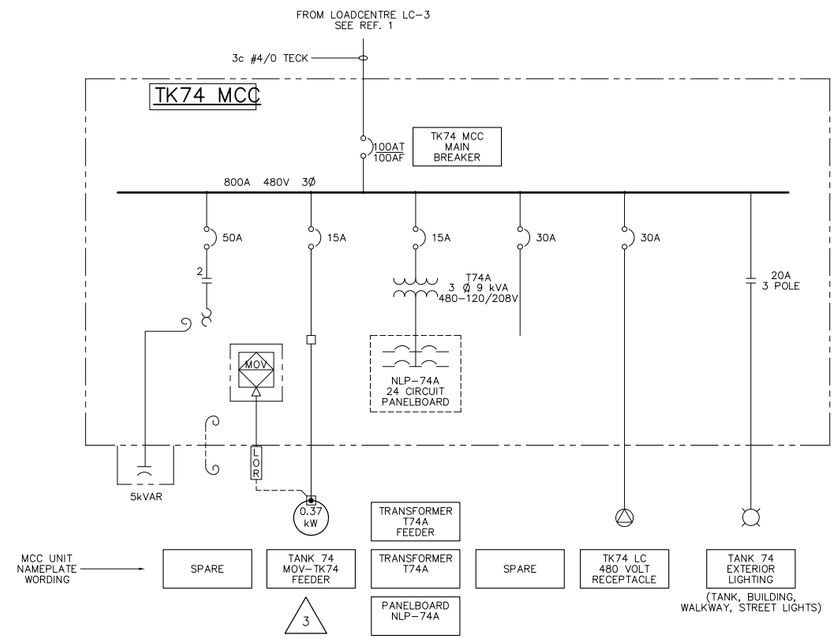
KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY MR	SINGLE LINE DIAGRAM TK84 MCC TANK 84	SHEET SIZE A1
CHECKED BY LS		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/08/29

DRAWING NUMBER

AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13343	C1A01	BB00	EE1037	2	4



NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.
2. EXTRACTED FROM DRAWING EE1040.

NO	REFERENCE DRAWINGS	DRAWING NO
6	NLP-74A PANEL BOARD SCHEDULE	EE1040 SHEET 3
5	TK74 MCC ELEVATION	EE1040 SHEET 1
4	LIGHTING CONTACTOR WIRING	EE1120
3	MOV STARTER WIRING	EE1119
2	MIXER STARTER WIRING	EE1118
1	S.L.D. PUMPHOUSE & TANK AREA	EE1021

NO	DATE	REVISION	DRN	CHK	APPR
3	14/04/04	AS BUILT, AFE 01-12627	TM	FA	
2	14/01/21	AS BUILT, AFE 01-13343	JJK	GL	
1	13/12/18	AS BUILT, AFE 01-13343	KCh	LS	
0	13/08/29	ISSUED FOR CONSTRUCTION, AFE 01-13343 (FE 213131)	KCh	LS	

KINDER MORGAN CANADA

TRANS MOUNTAIN

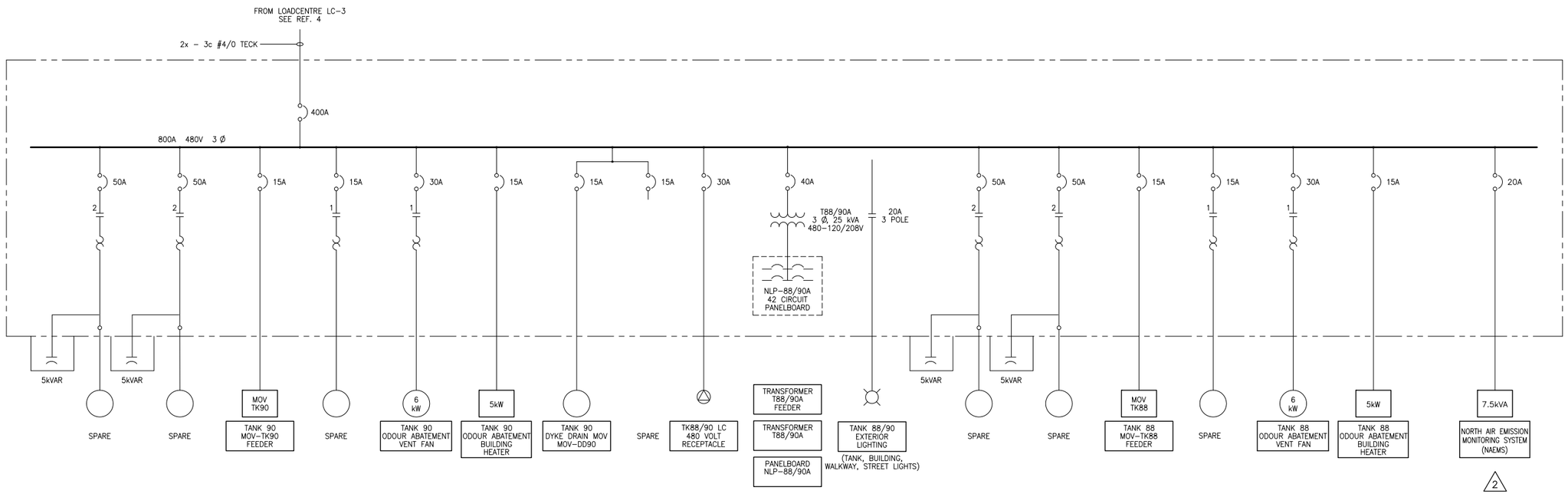
DRAWN BY MR	SINGLE LINE DIAGRAM TK74 MCC TANK 74	SHEET SIZE A1
CHECKED BY LS		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/08/29

DRAWING NUMBER

AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13343	C1A01	BB00	EE1040	2	3

NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.



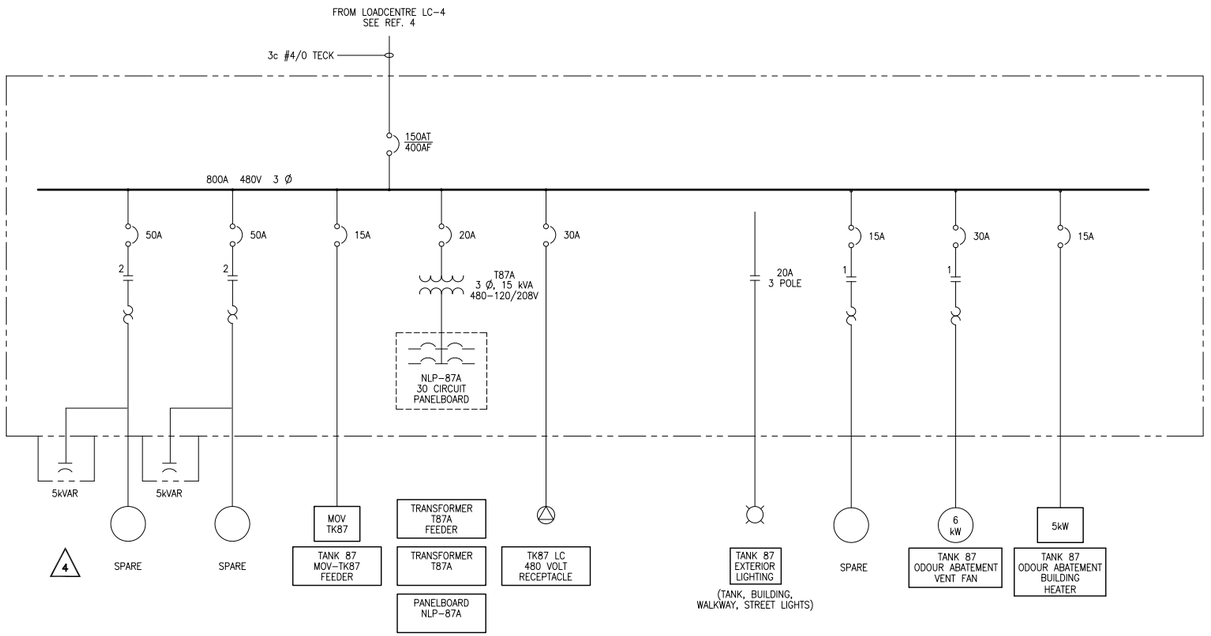
NO	REFERENCE DRAWINGS	DRAWING NO
2	PANELBOARD NLP-88/90A	EE132203
1	MCC ELEVATION TANK 88/90	EE132201

NO	DATE	REVISION	DRN	CHK	APPR
2	13/04/29	AS BUILT, AFE 01-13104	MR	MI	
1	13/03/25	AS-BUILT FMR #10394	LDP	PP	
0	13/03/08	AS-BUILT AFE# 01-13115 - DWG SPLIT TO SHTS 01, 02 & 03	JJK	GL	

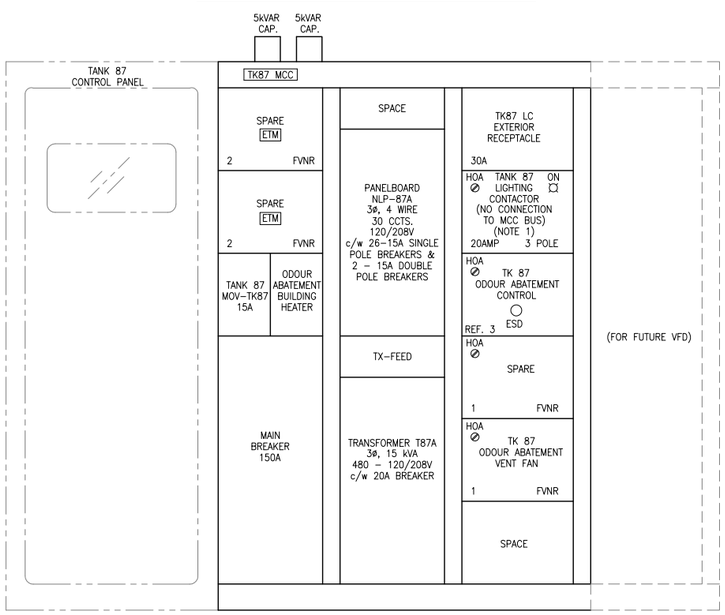
KINDER MORGAN CANADA

DRAWN BY JJK	SINGLE LINE DIAGRAM TANK 90/88	SHEET SIZE A1
CHECKED BY GL		SCALE N.T.S.
APPROVED BY	BURNABY TERMINAL	DATE 13/03/13

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
—	—	BB00	EE1322	2	2



TK87 MCC POWER DISTRIBUTION



TK87 MCC ELEVATION

PANEL NO.: 'NLP-87A'

LOCATION: TK87 MCC MAINS: 100 AMP PHASE/WIRE: 3 Ø/ 4W FEEDER SIZE:

MOUNTING: MCC VOLTS: 120/208V MAIN BKR: 20 AMP MFR./CAT. NO.:

LOAD	LOAD-WATTS A	LOAD-WATTS B	LOAD-WATTS C	TRIP AMPS	CCT. NO.	BUS A B C	CCT. NO.	TRIP AMPS	LOAD-WATTS A	LOAD-WATTS B	LOAD-WATTS C	LOAD
INTERIOR RECEPTACLES	1000			15	1		2	15	700			CONTROL PANEL RECEPTACLE, FAN, LIGHT,
AIR EXHAUST FAN		200		15	3		4	15				SPARE
INTERIOR LIGHTING			100	15	5		6	15				UPS 87 RECEPTACLE
PHOTOCELL & LIGHTING CONTACTOR	20			15	7		8	15				STREET LIGHTING
BUILDING HEATING	2000		2000	30	9		10	15				SPARE
					11		12	15				SPARE
SPARE				15	13		14					
SPARE				15	15		16	15				PLC OUTPUTS
SCRUBBER LTS				15	17		18	15				SPARE
SCRUBBER HEAT TRACING				15	19		20	15				TK87 EXTERIOR LTG (TANK,BLDG,WALKWAY)
SPARE				15	21		22	15				SPARE
SPARE				15	23		24	15				SPARE
SPARE				15	25		26	15				SPARE
SPARE				15	27		28	15				SPARE
SPARE				15	29		30	15				SPARE

NOTES: SODIUM VAPOUR LIGHTING, MOTOR, CONTROL PANEL & SIMILAR INDUCTIVE LOADS SHALL BE LISTED IN VOLT-AMPS INSTEAD OF WATTS.

PANELBOARD NLP-87A

LOCATED IN TK87 MCC

NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.

NO	REFERENCE DRAWINGS		DRAWING NO
4	SINGLE LINE DIAGRAM-F.P.H. & TANK AREA	EE1021	
3	SCHEMATIC & WIRING ESD TK 87	EE1348	
2	MOV STARTER WIRING	EE1156	
1	MIXER STARTER WIRING	EE1160	

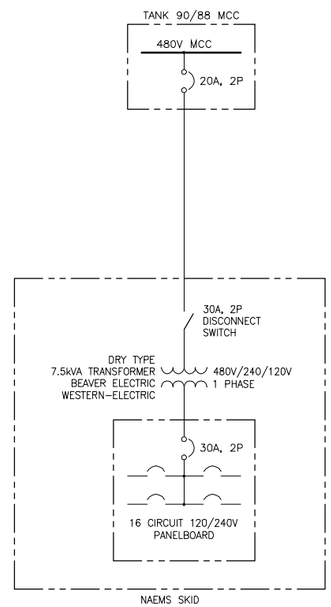
NO	DATE	REVISION	DRN	CHK	APPR
4	16/06/16	AS-BUILT PER FIELD MARKUP	RLY	BD	
3	13/03/25	AS-BUILT FMR #10394	LDP	PP	
2	06/11/14	AS BUILT - FIELD REVIEW	LDP		
1	99/04/29	AS BUILT JOB 8171 - ODOUR ABATEMENT SYSTEM	DA	AAW	AAW
0	99/02/01	AS BUILT JOB 8171 - TERMINAL REPOWERING	DA	AAW	

KINDER MORGAN

TRANS MOUNTAIN

DRAWN BY M.T.	SINGLE LINE DIAGRAM TANK 87 MCC PANEL NLP-87A	SHEET SIZE A1
CHECKED BY D.D.		SCALE N.T.S.
APPROVED BY A.A.W.	BURNABY TERMINAL	DATE 98/05/07

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
—	—	BB00	EE1323		4



NO	REFERENCE DRAWINGS	DRAWING NO
1	DISTRIBUTION PANEL SCHEDULE, NAEMS, TANK 88	EE146602

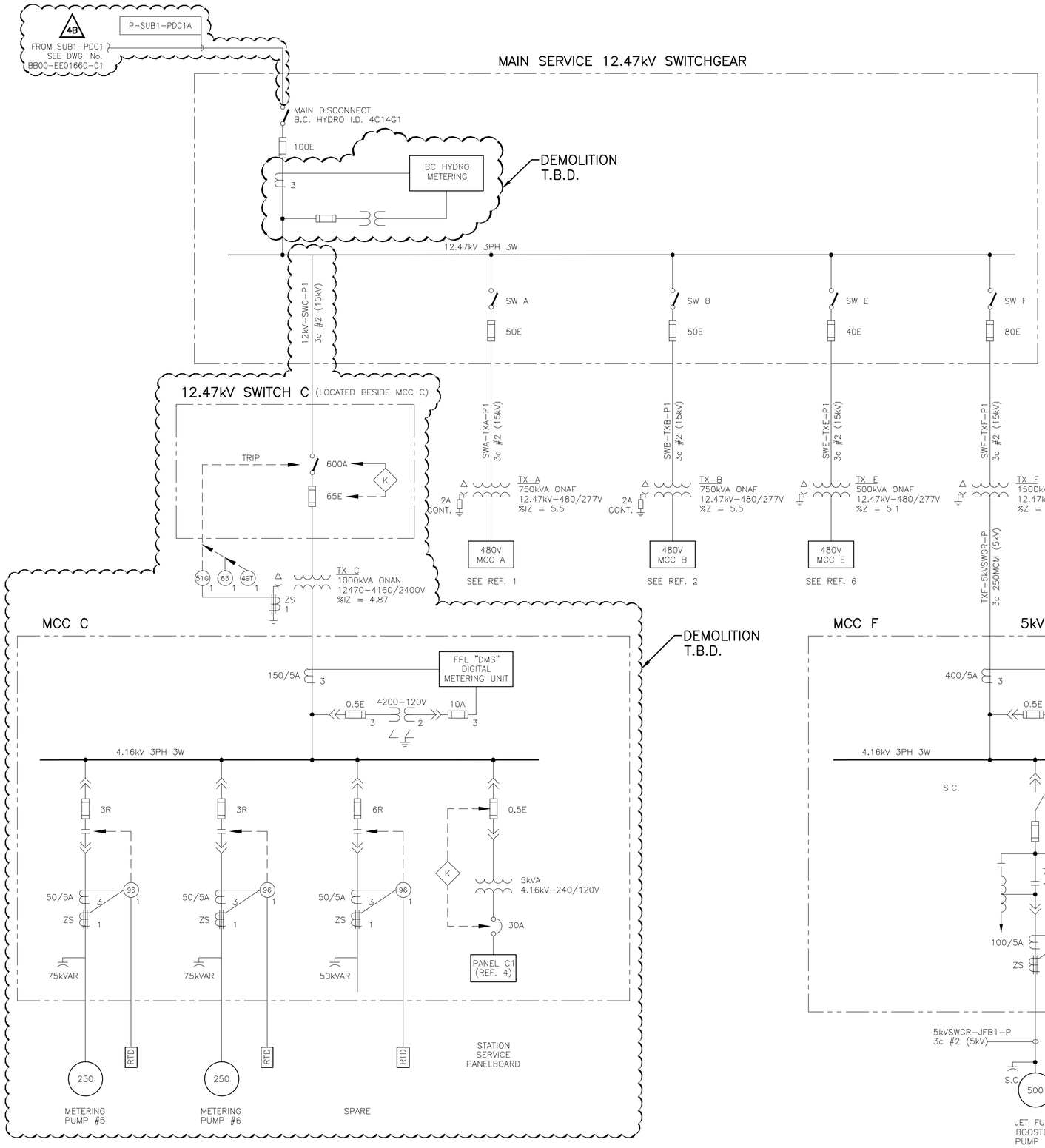
NO	DATE	REVISION	DRN	CHK	APPR
1	13/04/29	AS BUILT, AFE 01-13104	MR	MI	
0	13/01/31	ISSUED FOR CONSTRUCTION, AFE 01-13104 (FE 213027.00)	KCh	MI	

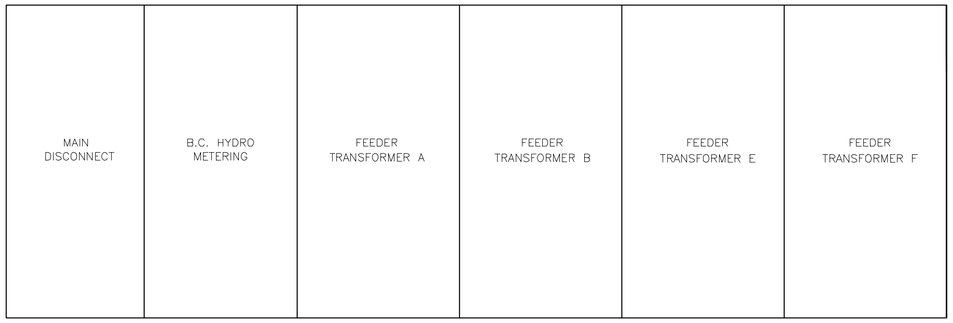
KINDER MORGAN CANADA

TRANS MOUNTAIN

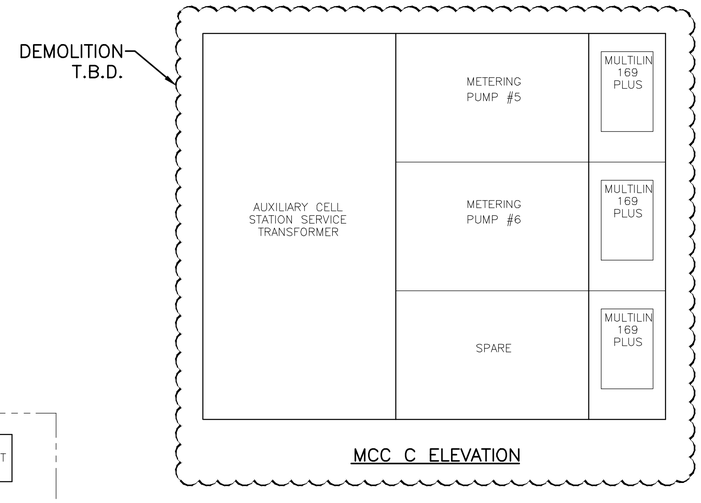
DRAWN BY KCh	SINGLE LINE DIAGRAM NAEMS	SHEET SIZE A1
CHECKED BY MI		SCALE NTS
APPROVED BY	UPPER ROAD TANK 88 BURNABY TERMINAL	DATE 13/01/23

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13104	C1A01	BB00	EE1466	1	1

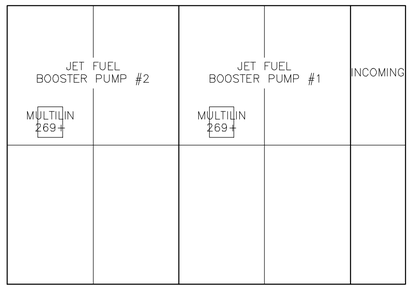




MAIN SERVICE SWITCHGEAR ELEVATION
(LOCATED IN MCC 'A' BUILDING)



MCC C ELEVATION



5kV SWITCHGEAR ELEVATION

NOTES:

1. FOR MCC-A BUILDING ELECTRICAL LAYOUT, SEE REF. 3.

ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWINGS	DRAWING NO.	NO.	DATE	REVISION	DR.	CHK.	APPR.	NO.	DATE	REVISION	DR.	CHK.	APPR.
6	480V SINGLE LINE DIAGRAM – MCC E	EE1047							4A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
5	PARTIAL PLOT PLAN & DIST. BLK. DIAG.	EE1015							4	06/11/14	AS BUILT – FIELD REVIEW	LDP		
4	LIGHTING PANEL SCHEDULES (4 SHT.'s)	EE1051							3	98/10/30	AS BUILT JOB 7224 – JET FUEL PUMP	M.T.	J.N.	
3	ELECTRICAL LAYOUTS – MCC-A BLDG.	EE1065							2	95/07/04	AS-BUILT	B.P.		
2	480V SINGLE LINE DIAGRAM – MCC B	EE1025	4C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE	1	94/11/09	AS-BUILT (AFE 4126)	T.L.	A.A.W.	A.A.W.
1	480V SINGLE LINE DIAGRAM – MCC A	EE1024	4B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE	0	94/05/17	REDRAWN FROM EE2000, REV.3	G.P.	B.M.	

KINDER MORGAN CANADA INC. TRANS MOUNTAIN

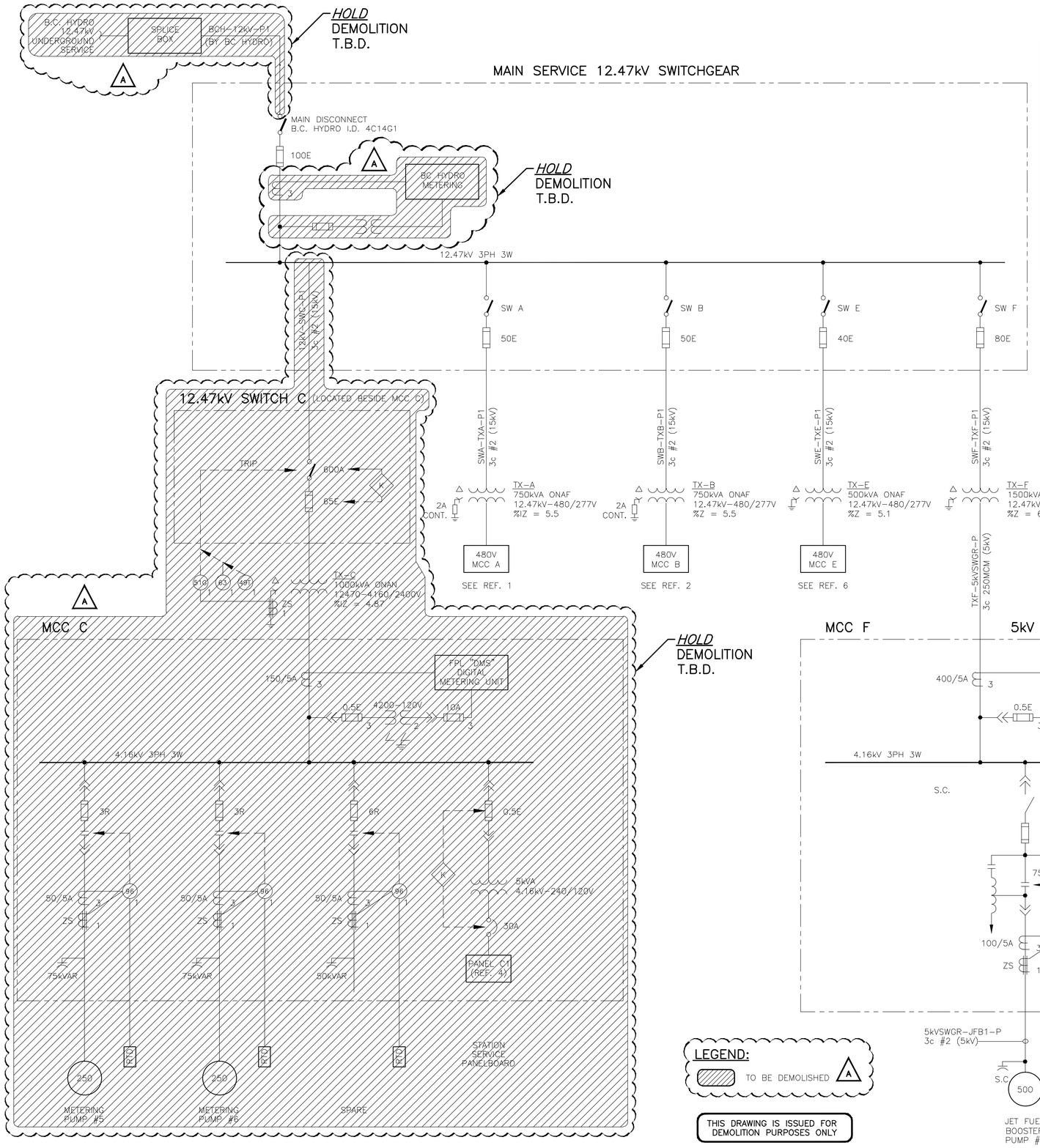
DRAWN G.P.
CHECKED G.W.
APPROVED

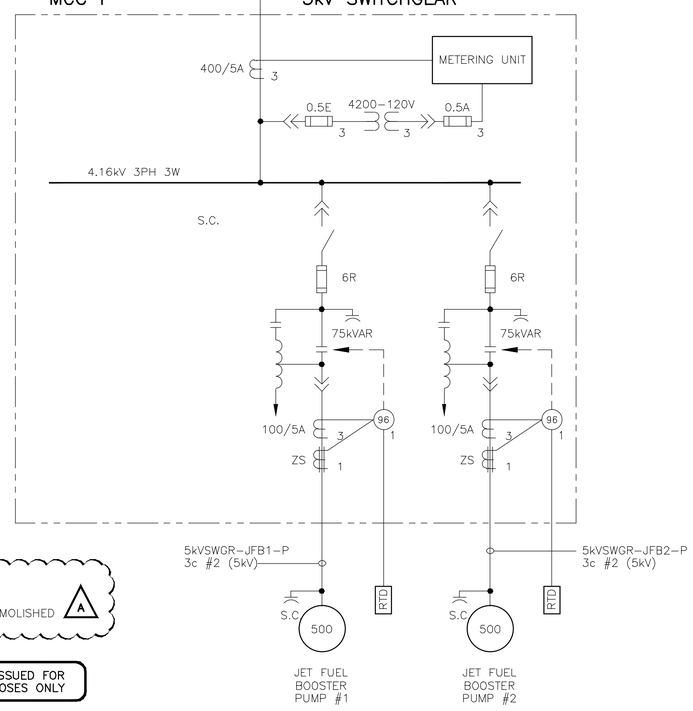
12.47kV AND 4.16kV SINGLE LINE DIAGRAM LOWER TANK FARM AREA

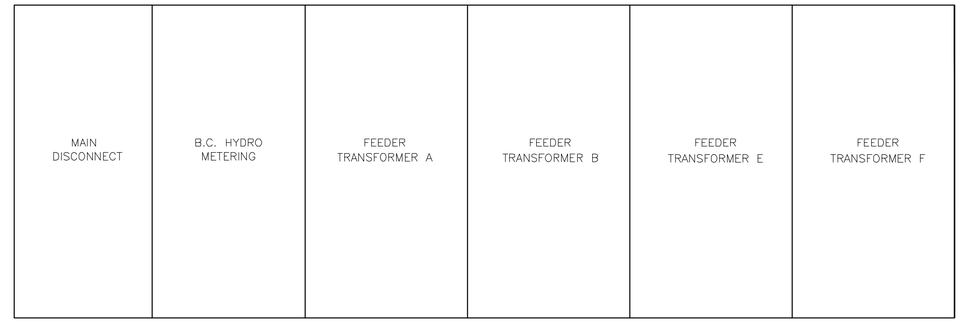
BURNABY TERMINAL

SHEET SIZE AA1
SCALE NONE
DATE 91/02/08

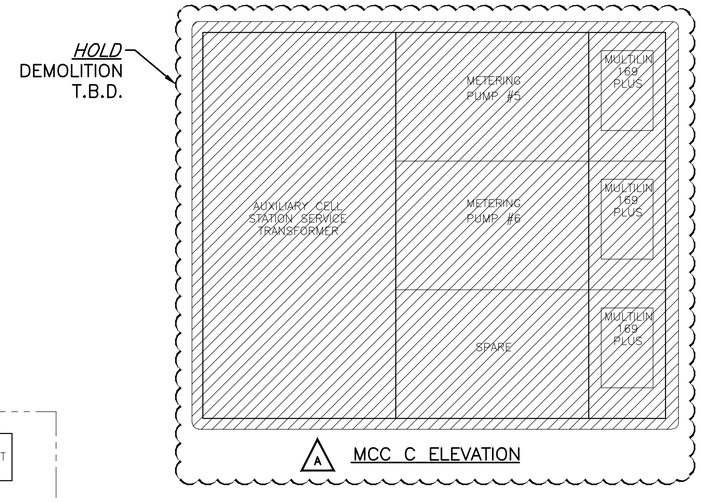
DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	EE1020		4C



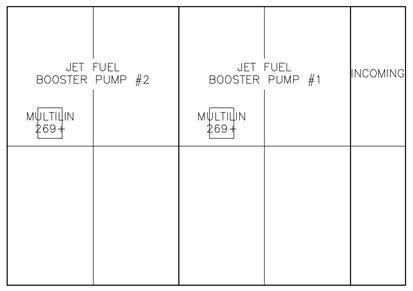




MAIN SERVICE SWITCHGEAR ELEVATION
(LOCATED IN MCC 'A' BUILDING)



MCC C ELEVATION



5kV SWITCHGEAR ELEVATION

NOTES:

1. FOR MCC-A BUILDING ELECTRICAL LAYOUT, SEE REF. 3.

LEGEND:

TO BE DEMOLISHED (A)

THIS DRAWING IS ISSUED FOR DEMOLITION PURPOSES ONLY

ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWINGS	DRAWING NO.
6	480V SINGLE LINE DIAGRAM – MCC E	EE1047
5	PARTIAL PLOT PLAN & DIST. BLK. DIAG.	EE1015
4	LIGHTING PANEL SCHEDULES (4 SHT.'s)	EE1051
3	ELECTRICAL LAYOUTS – MCC-A BLDG.	EE1065
2	480V SINGLE LINE DIAGRAM – MCC B	EE1025
1	480V SINGLE LINE DIAGRAM – MCC A	EE1024

NO.	DATE	REVISION	DR.	CHK.	APPR.
A	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

KINDER MORGAN CANADA INC. — TRANS MOUNTAIN

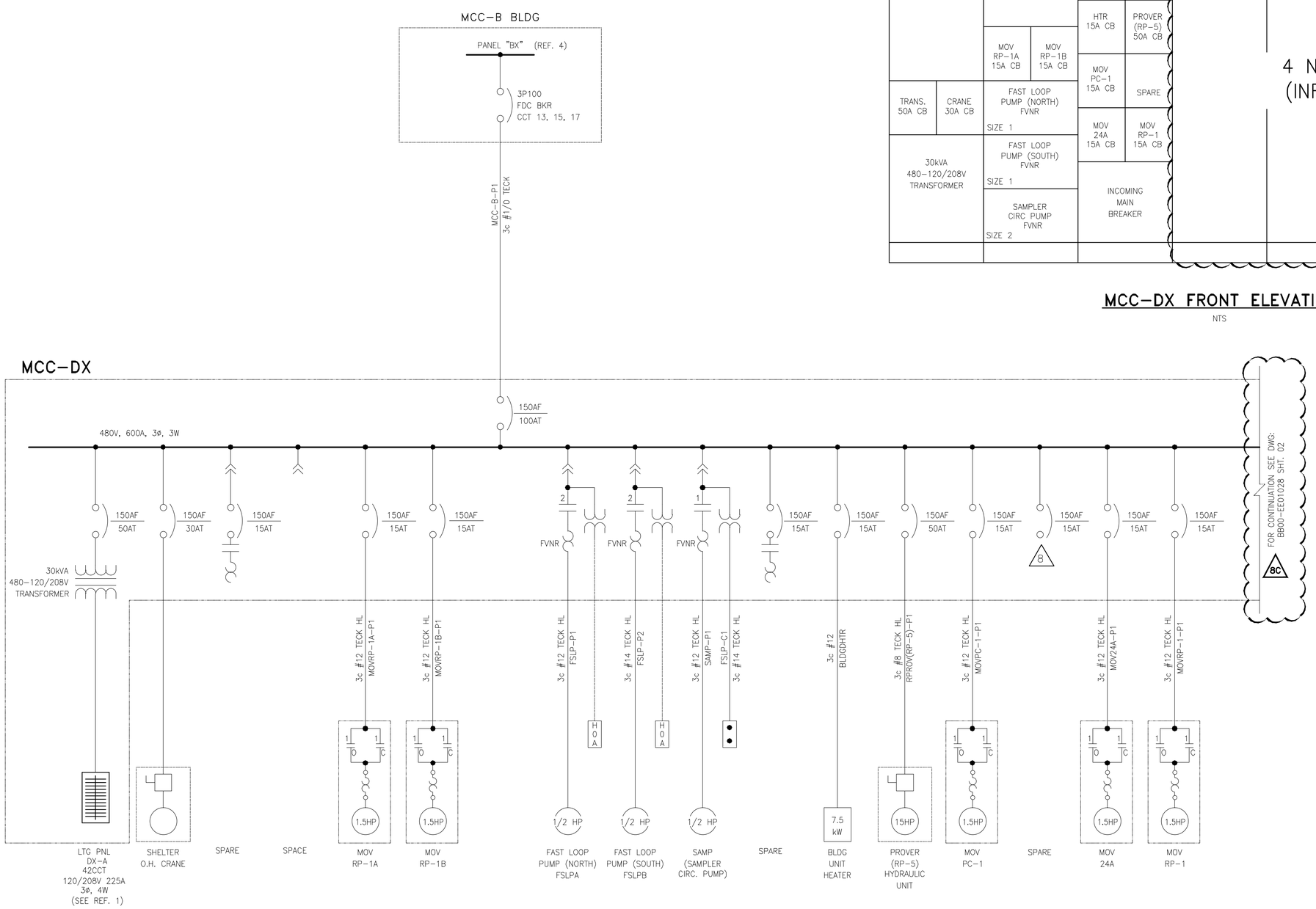
DRAWN G.P.
CHECKED G.W.
APPROVED

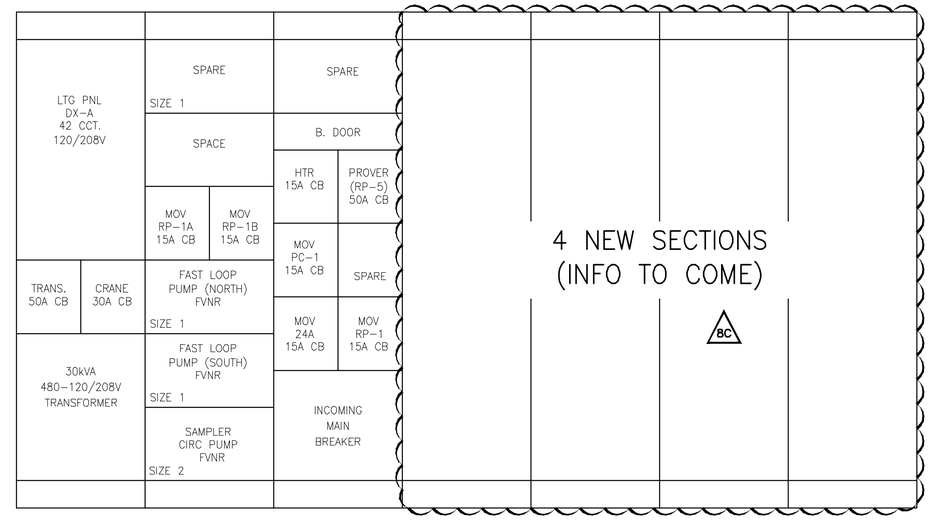
DEMOLITION – 12.47kV AND 4.16kV SINGLE LINE DIAGRAM LOWER TANK FARM AREA

BURNABY TERMINAL

SHEET SIZE AA1
SCALE NONE
DATE 91/02/08

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
—	—	BB00	— EE1020D		A





MCC–DX FRONT ELEVATION

NTS

ch2m
11 JAN 2017
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FOR
DESIGN

NO	REFERENCE DRAWINGS	DRAWING NO	NO	DATE	REVISION	DRN	CHK	APPR	NO	DATE	REVISION	DRN	CHK	APPR
6	MOV RP–1A, RP–1B SCHEM.	EIM82436	8C	2017/01/11	ISSUED FOR DESIGN AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE	5	11/05/25	AS BUILT PER FMR #10360 (C/W FIELD VERIFICATION)	LDP	BDC	
5	CONTROL BLDG. MCC D EQUIPMENT LAYOUT	EE1067	8B	2016/12/13	RE–ISSUED FOR REVIEW AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE	4	07/12/18	VECO PROJECT 3560–0200. ASBUILT PER FIELD INFO	WM	RL	
4	480V S.L.D. CDP PANEL BX	EE1027	8A	2016/09/30	ISSUED FOR APPROVAL AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE	3	.	VECO PROJECT 3560–0300. ISSUED FOR APPROVAL. ADDED MOV–SH–1A & MOV–CH005A.	DM	RL	
3	MOTOR & MISC. ELECTRICAL SCHEMATIC	EE1137	8	16/05/24	AS BUILT, FMR #10412	RLY	DG		2	06/10/04	VECO PROJECT 3560–0200. ISSUED FOR APPROVAL. ADDED MOV–RP–1A & MOV–RP–1B.	WM	RL	
2	MOV 24A, RP–1, PC–1 & SH–1 SCHEM.	EE1136	7	12/03/09	AS BUILT, AFE 01–12912 (FE 211021.01)	MR	BR		1	95/07/17	AS BUILT	BP		
1	120/208V LIGHTING PANEL DX–A	EE1050	6	11/09/26	ISSUED FOR CONSTRUCTION, AFE 01–12912 (FE 211021.01)	DWM	PR		0	94/05/18	REDRAWN FROM EE2500, REV.1	SM		

KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY: SM
CHECKED BY:
APPROVED BY:

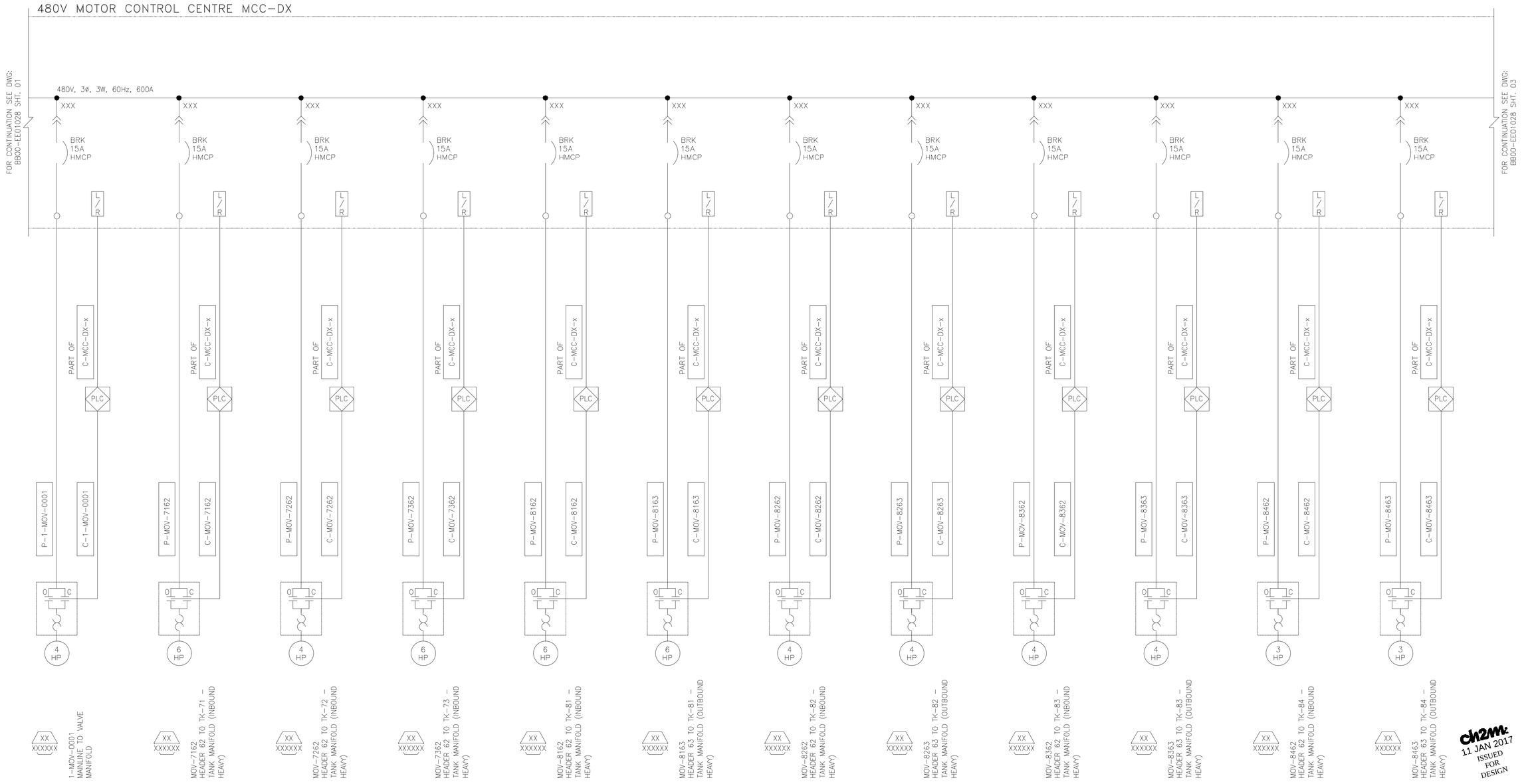
SINGLE LINE DIAGRAM
MCC–DX (480V)
IN MCC–D BLDG
REFINED PRODUCTS
BURNABY TERMINAL

SHEET SIZE: A1
SCALE: NONE
DATE: 94/05/18

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01–13283	—	BB00	EE102B	01	8C

LEGEND:

H O A	HAND–OFF–AUTO
O / O	ON/OFF
L / R	LOCAL/REMOTE
S / S	START/STOP
A / O	AUTO/OFF
XX ← REFERENCE No.	
XXXXX ← SCHEMATIC DWG NUMBER	

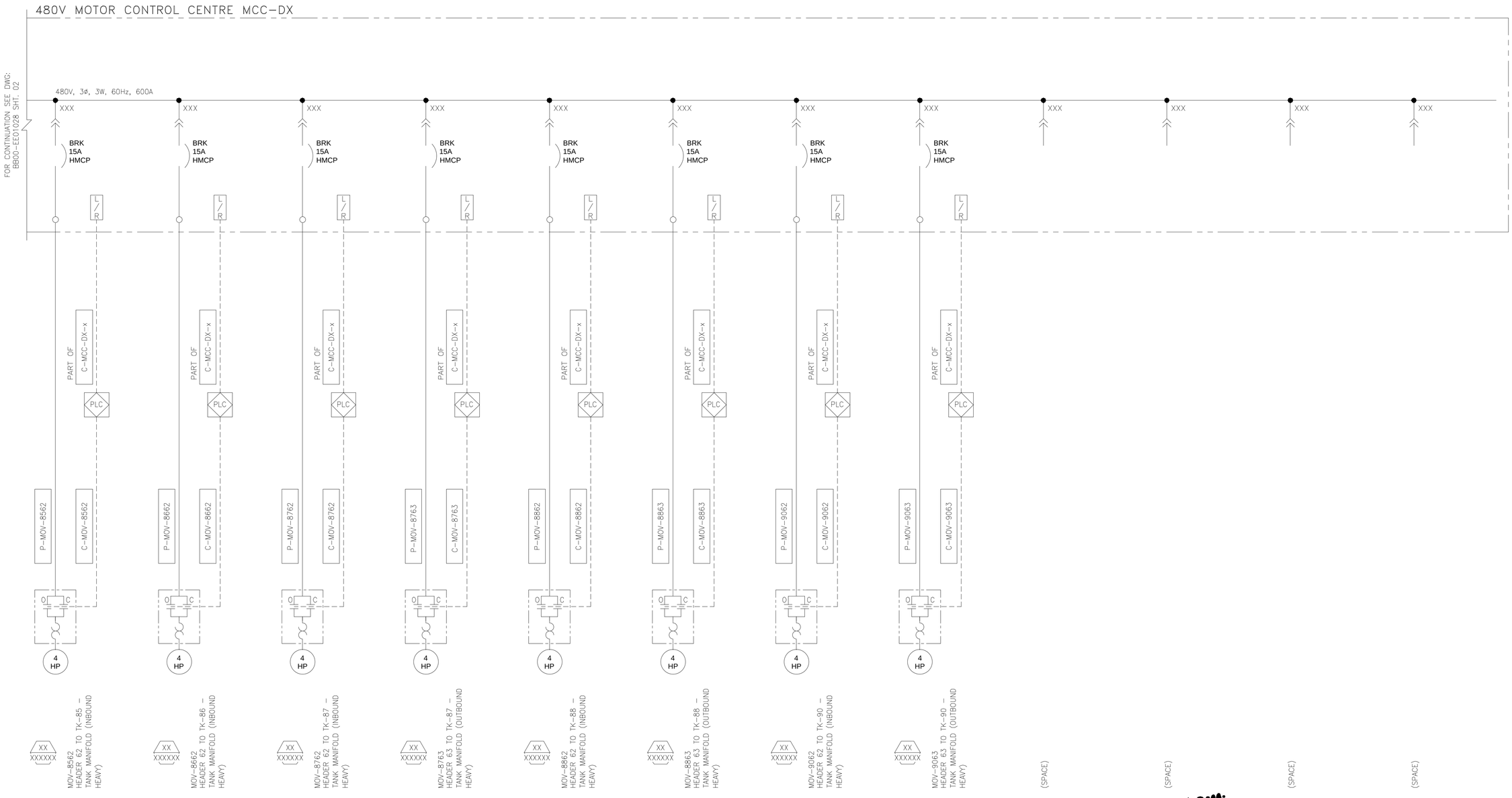


NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE
			B	13DEC2016	RE–ISSUED FOR REVIEW AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 480 VOLT DISTRIBUTION MCC–DX (480V) TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01–13283	BB00	EE01028	02	C



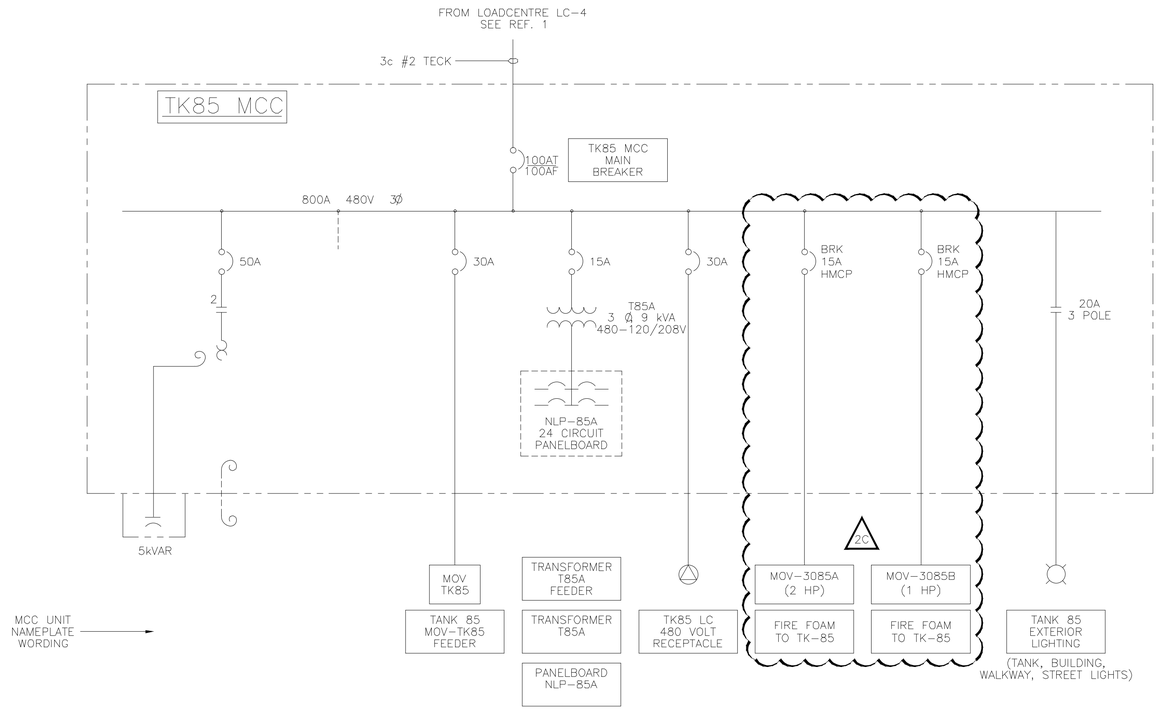
ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO.	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 480 VOLT DISTRIBUTION MCC-DX (480V) TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01028	03	C



NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.
2. EXTRACTED FROM DRAWING BB00-EE1033.

ch2m:
11 JAN 2017
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DESIGN

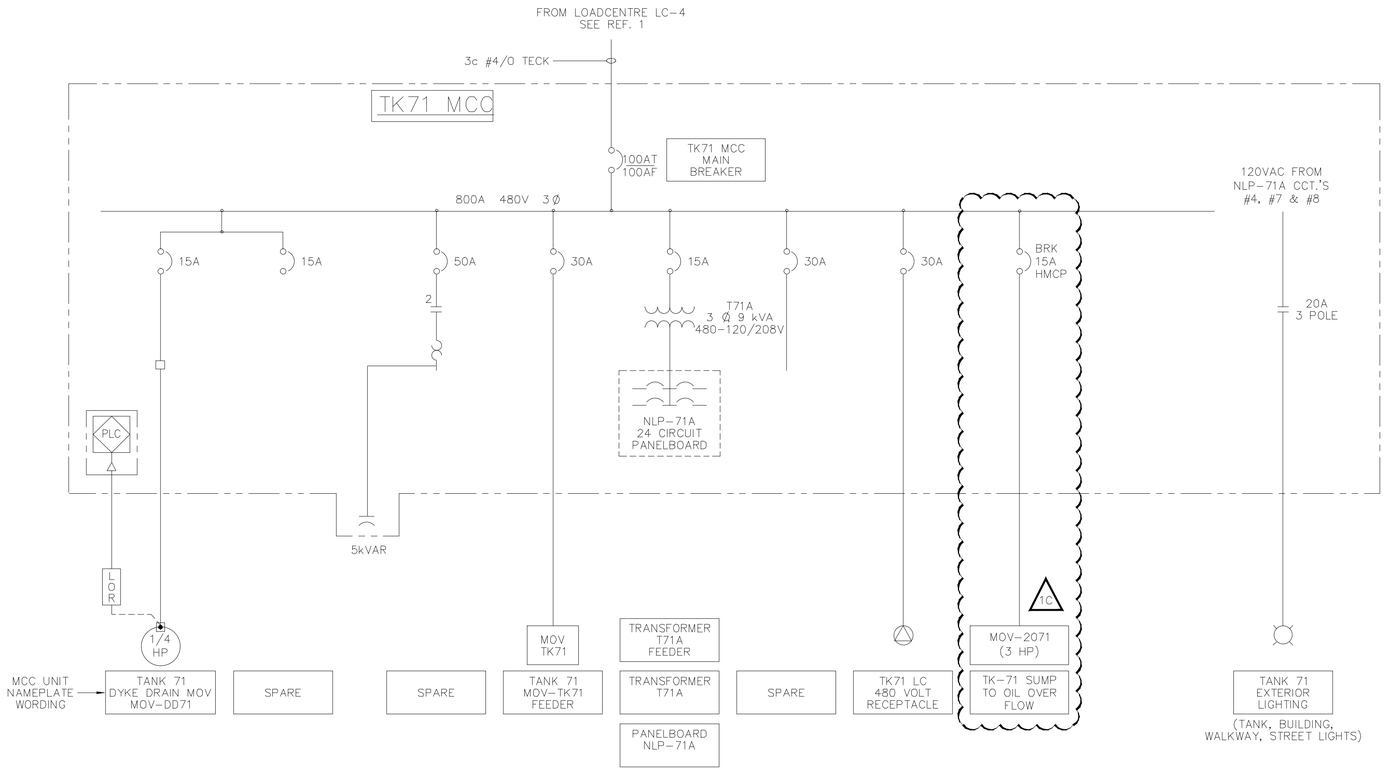
NO	REFERENCE DRAWINGS	DRAWING NO	NO	DATE	REVISION	DRN	CHK	APPR	NO	DATE	REVISION	DRN	CHK	APPR
6	NLP-85A PANEL BOARD SCHEDULE	EE1033 SHEET 3							2C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
5	TK85 MCC ELEVATION	EE1033 SHEET 1							2B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
4	LIGHTING CONTACTOR WIRING	EE1148							2A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
3	MOV STARTER WIRING	EE1147							2	14/01/21	AS BUILT, AFE 01-13343	JJK	GL	
2	MIXER STARTER WIRING	EE1146							1	13/12/18	AS BUILT, AFE 01-13343	KCh	LS	
1	S.L.D. PUMPHOUSE & TANK AREA	EE1021							0	13/08/29	ISSUED FOR CONSTRUCTION, AFE 01-13343 (FE 213131)	KCh	LS	

KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY MR	SINGLE LINE DIAGRAM TK85 MCC TANK 85	SHEET SIZE A1
CHECKED BY LS		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/08/29

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283—		— BB00	— EE1033	2	2C



TK71 MCC POWER DISTRIBUTION

NOTES:

1. MCC UNIT INCLUDES EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.

ch2m 11 JAN 2017 ISSUED FOR DESIGN

NO	REFERENCE DRAWINGS	DRAWING NO
5	NLP-71A LIGHTING PANEL SCHEDULE	EE1474
4	MOV-DD71 SCHEMATIC & WIRING	EE1461
3	TANK 71 EXTERIOR LIGHTING SCHEMATIC & WIRING	EE1145
2	MOV-TK71 SCHEMATIC & WIRING	EE1144
1	PUMPHOUSE & TANK AREA SINGLE LINE DIAGRAM	EE1021

NO	DATE	REVISION	DRN	CHK	APPR
1C	17/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
1B	16/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
1A	16/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
1	14/02/28	AS BUILT, AFE 01-13277	DWM	FA	
0	13/03/25	ISSUED FOR CONSTRUCTION, AFE 01-13277 (FE 212269.00)	KCh	FA	

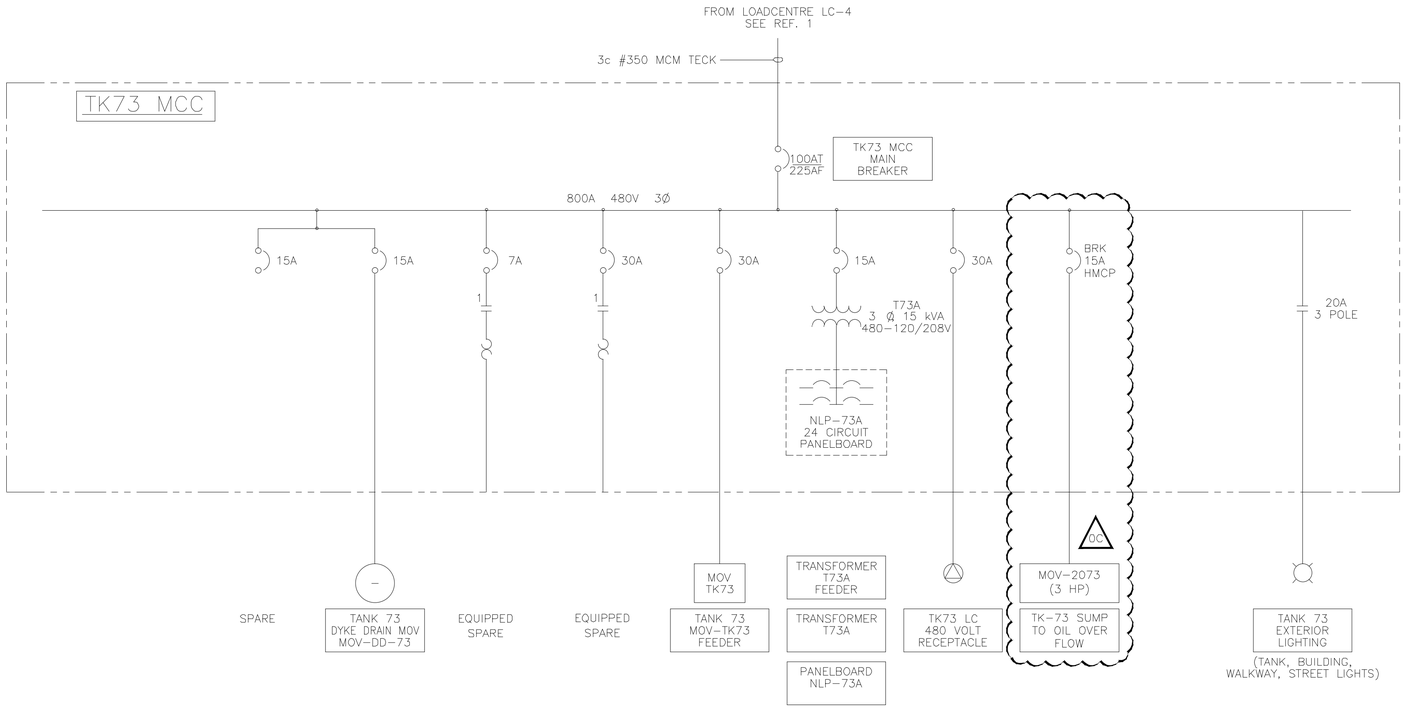
KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY DWM	SINGLE LINE DIAGRAM TK71 MCC TANK 71	SHEET SIZE A1
CHECKED BY FA		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/03/14

DRAWING NUMBER

AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283		BB00	EE1034	2	1C



TK73 MCC POWER DISTRIBUTION

NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.

ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO	REFERENCE DRAWINGS	DRAWING NO
2	PANELBOARD NLP-73A TANK 73	EE103503
1	MCC ELEVATION TANK 73	EE103501

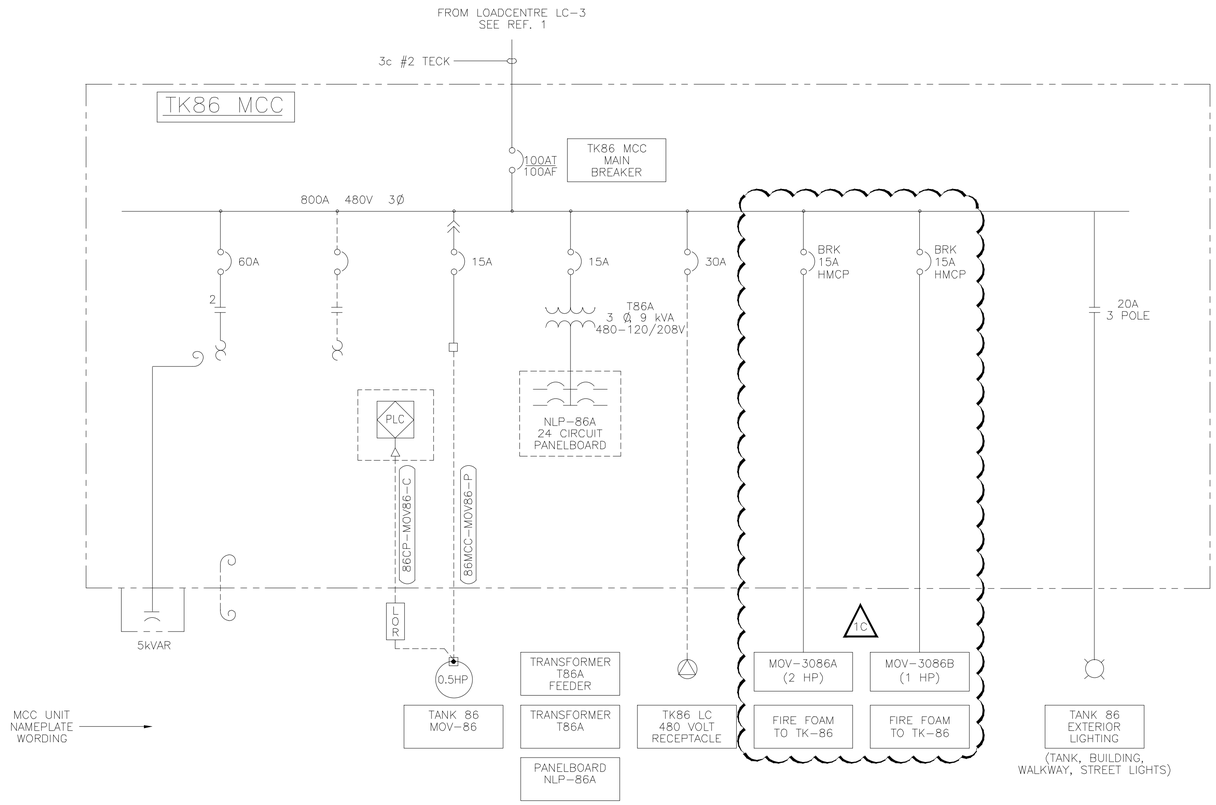
NO	DATE	REVISION	DRN	CHK	APPR
0C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
0B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
0A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
0	13/03/13	AS-BUILT AFE# 01-13204	JJK	AL	

KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY	MCC SINGLE LINE DIAGRAM TANK 73	SHEET SIZE A1
CHECKED BY		SCALE N.T.S.
APPROVED BY	BURNABY TERMINAL	DATE 13/03/13

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283—		— BB00	— EE1035	2	0C



ch2m
11 JAN 2017
ISSUED
FOR
DESIGN

NOTES:

1. MCC UNIT TO INCLUDE EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.

NO	REFERENCE DRAWINGS	DRAWING NO
5	PANEL BOARD NLP-86 TANK 86	EE103803
4	MCC ELEVATION TANK 86	EE103801
3	LIGHTING CONTACTOR WIRING	EE1114
2	MOV STARTER	EE111301, EE111302
1	LC3, UPPER TANK FARM AREA	EE131901, EE131902

NO	DATE	REVISION	DRN	CHK	APPR
1C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
1B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
1A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
1	13/01/21	AS-BUILT AFE 01-12887	JJK	GL	GL
0	13/01/07	ISSUED FOR CONSTRUCTION AFE 01-12887	JJK	GL	GL

KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY MH

CHECKED BY

APPROVED BY

MCC SINGLE LINE DIAGRAM
TANK 86

BURNABY TERMINAL

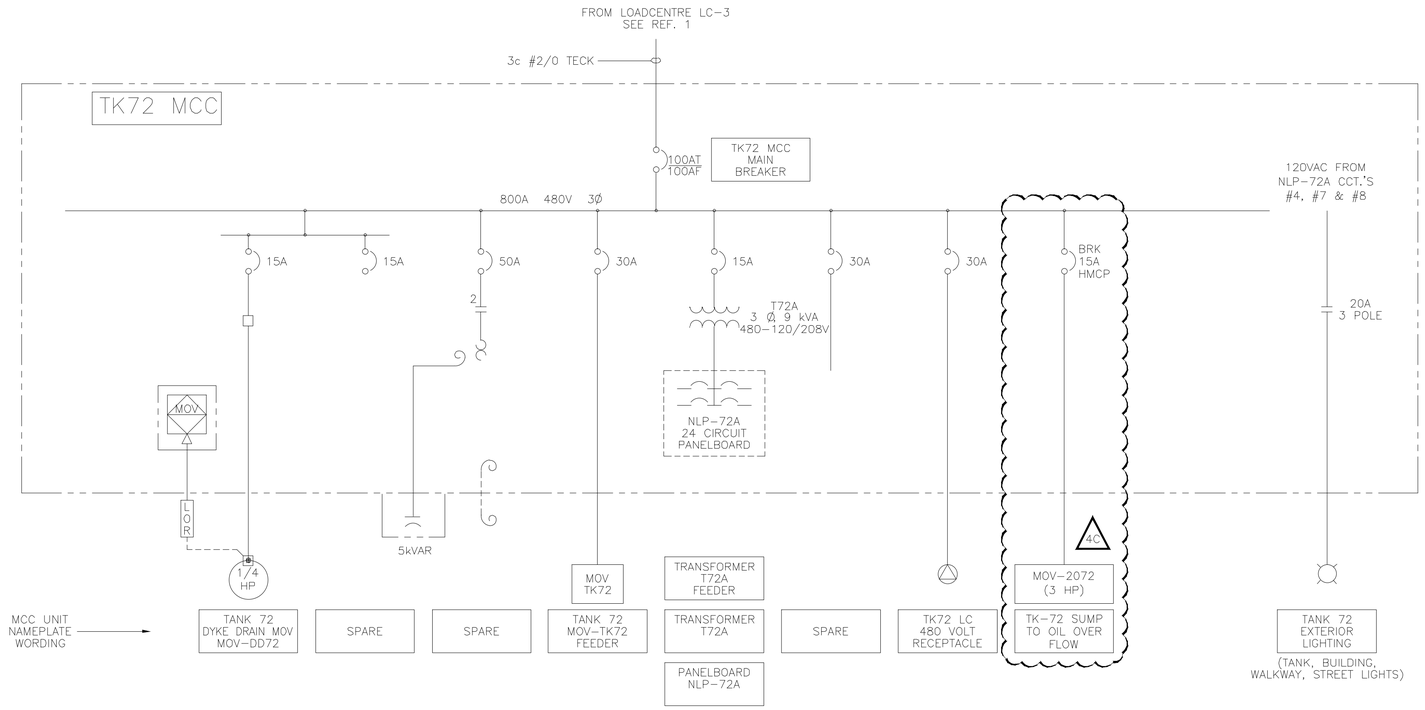
SHEET SIZE A1

SCALE NTS

DATE 13/01/02

DRAWING NUMBER

AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	—	BB00	EE1038	2	1C



NOTES:

1. MCC UNIT INCLUDES EXTERNAL WARNING LABEL ADVISING OF POWER FROM SEPARATE SOURCES.
2. EXTRACTED FROM DRAWING BB00-EE1039.

ch2m
11 JAN 2017
ISSUED
FOR
DESIGN

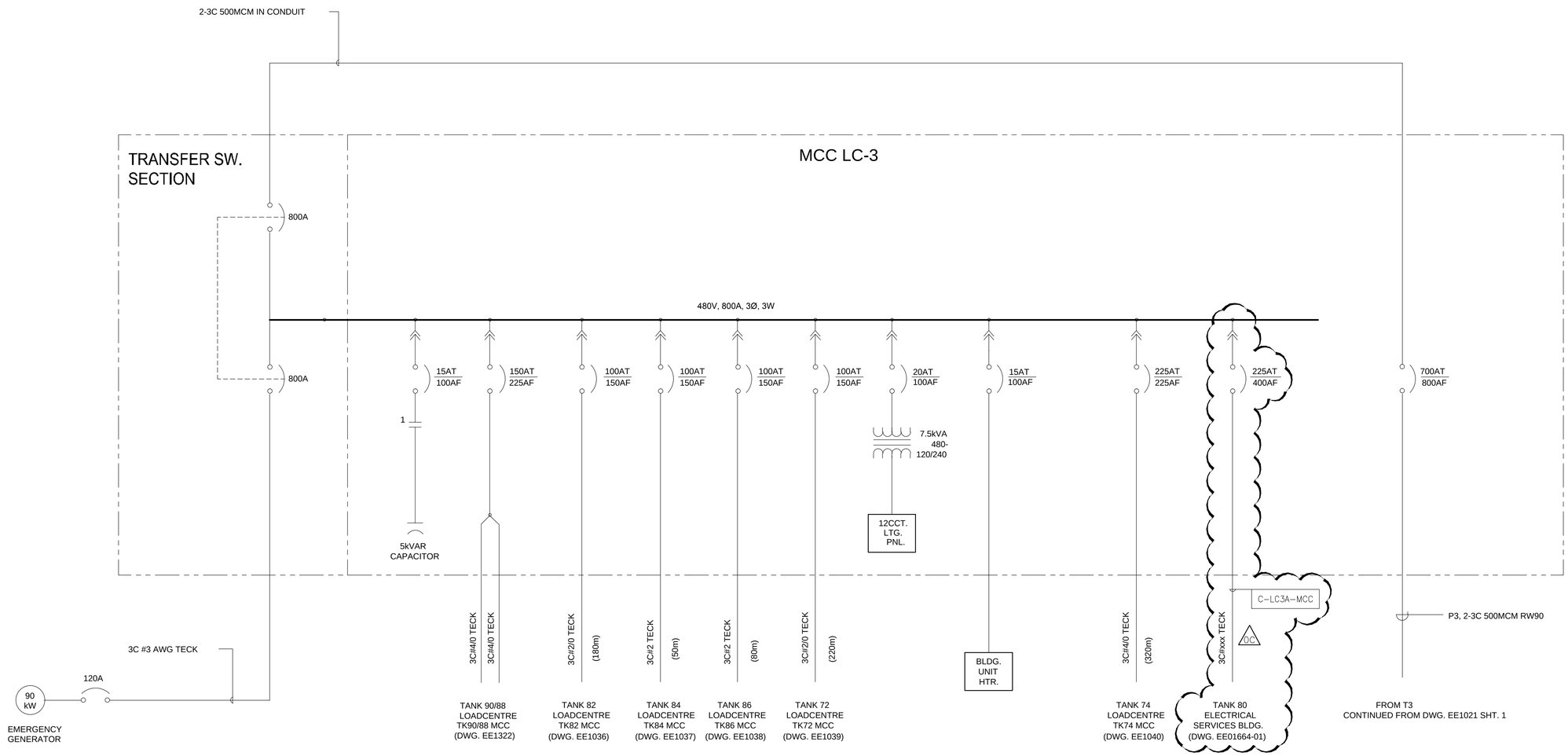
NO	REFERENCE DRAWINGS	DRAWING NO	NO	DATE	REVISION	DRN	CHK	APPR	NO	DATE	REVISION	DRN	CHK	APPR
6	NLP-72A PANEL BOARD SCHEDULE	EE103903							4A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
5	TK72 MCC ELEVATION	EE103901							4	15/04/10	AS BUILT, AFE 01-13576	MR	KS	
4	LIGHTING CONTACTOR WIRING	EE1117							3	14/05/30	ISSUED FOR CONSTRUCTION, AFE 01-13576 (TT 214018.00)	MR	FA	
3	MOV STARTER WIRING	EE1116							2	14/01/21	AS BUILT, AFE 01-13343	JJK	GL	
2	MIXER STARTER WIRING	EE1115	4C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE	1	13/12/18	AS BUILT, AFE 01-13343	KCh	LS	
1	S.L.D. PUMPHOUSE & TANK AREA	EE1021	4B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE	0	13/08/29	ISSUED FOR CONSTRUCTION, AFE 01-13343 (FE 213131)	KCh	LS	

KINDER MORGAN CANADA

TRANS MOUNTAIN

DRAWN BY MR	SINGLE LINE DIAGRAM TK72 MCC TANK 72	SHEET SIZE A1
CHECKED BY LS		SCALE NTS
APPROVED BY	BURNABY TERMINAL	DATE 13/08/29

DRAWING NUMBER					
AFE	WBS	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283—		— BB00	— EE1039	2	4C



ch2m
11 JAN 2017
ISSUED FOR DESIGN

NO.	REFERENCE DRAWINGS	DRAWING NO.
3	SINGLE LINE DIAGRAMS & MCC LAYOUTS	EE1031 TO EE1040
2	SINGLE LINE DIAGRAM FIRE PUMPHOUSE	EE1021 (2 SHEETS)
1	ELECTRICAL KEY PLAN	EE1000

NO.	DATE	REVISION	DR.	CHK.	APPR.
0C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
0B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
0A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
0	99/05/31	AS BUILT JOB 7134 (GENERATOR FOR LC-3 ADDED), FORMERLY PART OF EE1021 SHEET 1	DA	AAW	AAW

TRANS MOUNTAIN

DRAWN DA
CHECKED AAW
APPROVED

480V SINGLE LINE DIAGRAM
LC-3
UPPER TANK FARM AREA

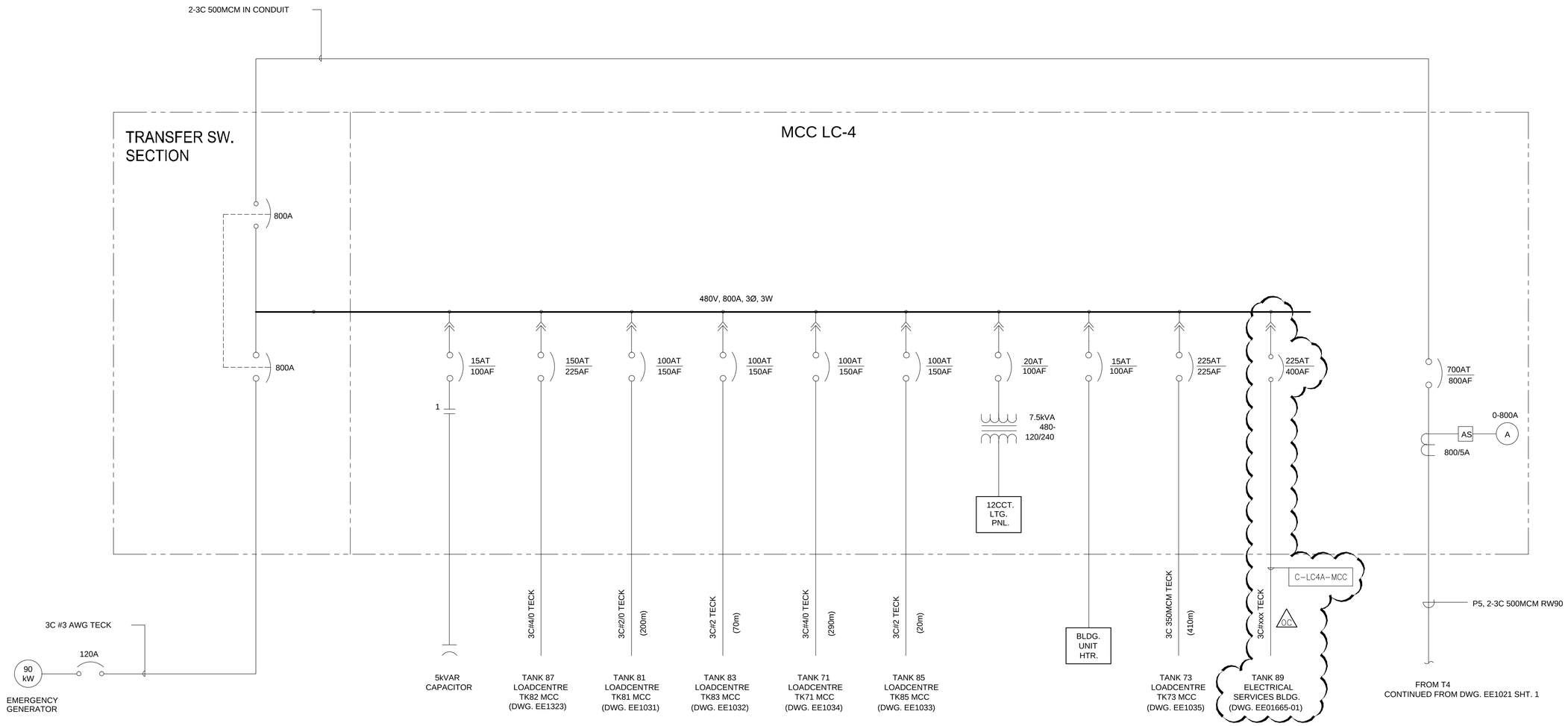
BURNABY TERMINAL

SHEET SIZE A1
SCALE NONE
DATE 97/11/15

DRAWING NUMBER

AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
01-13283		BB00	EE1319	1/2	0C

SAVE NAME: CAD\EB00\E\EE131901 10-JUN-99 9:24 AM PLOT SCALE: 1:1



ch2m:
11 JAN 2017
ISSUED FOR DESIGN

NO.	REFERENCE DRAWINGS	DRAWING NO.
3	SINGLE LINE DIAGRAMS & MCC LAYOUTS	EE1031 TO EE1040
2	SINGLE LINE DIAGRAM FIRE PUMPHOUSE	EE1021 (2 SHEETS)
1	ELECTRICAL KEY PLAN	EE1000

NO.	DATE	REVISION	DR.	CHK.	APPR.
0C	2017/01/11	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
0B	2016/12/13	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
0A	2016/09/30	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
0	99/05/31	AS BUILT JOB 7134 (GENERATOR FOR LC-4 ADDED), FORMERLY PART OF EE1021 SHEET 1	DA	AAW	AAW

TRANS MOUNTAIN

DRAWN DA	480V SINGLE LINE DIAGRAM LC-4 LOWER TANK FARM AREA	SHEET SIZE A1
CHECKED AAW		SCALE NONE
APPROVED	BURNABY TERMINAL	DATE 97/11/15

DRAWING NUMBER					
AFE	WBS	FACILITY ID.	DOCUMENT No.	SHT.No.	REV.
01-13283—		— BB00	— EE1320	1/2	0C

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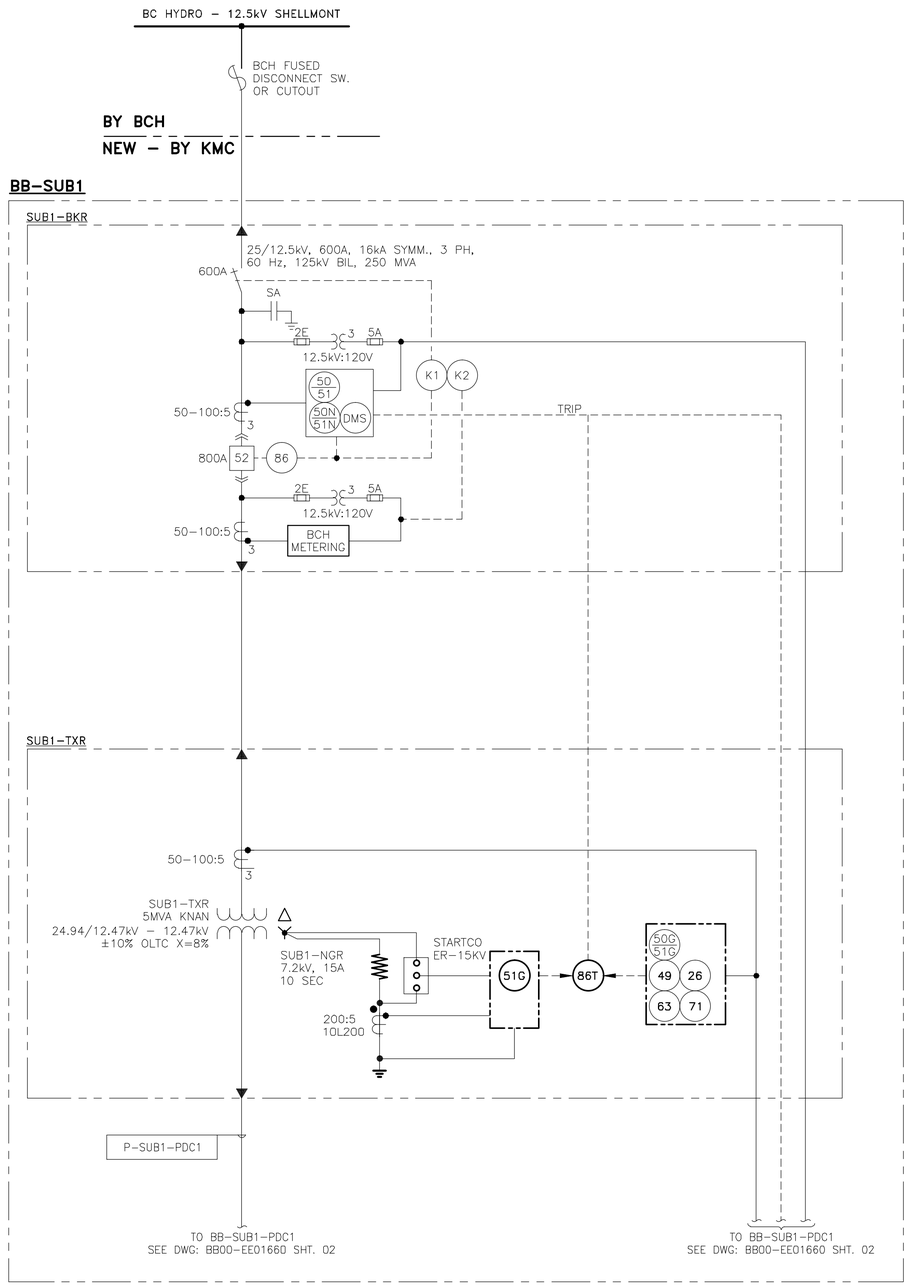


SINGLE LINE DIAGRAM NOTES:

1. DRAWING FORMATS USED ARE BASED ON CHAPPEL STATION DRAWING FORMATS.
2. 600V TRANSFORMER SIZES TO BE DETERMINED. NOMINAL SIZES SHOWN.
3. GENERATOR SIZES TO BE DETERMINED.
4. MCC CIRCUIT BREAKER SIZES TO BE DETERMINED. NOMINAL SIZES SHOWN.
5. UPS SIZES TO BE DETERMINED.
6. ALL PT'S, CT'S AND FUSE SIZES TO BE DETERMINED.

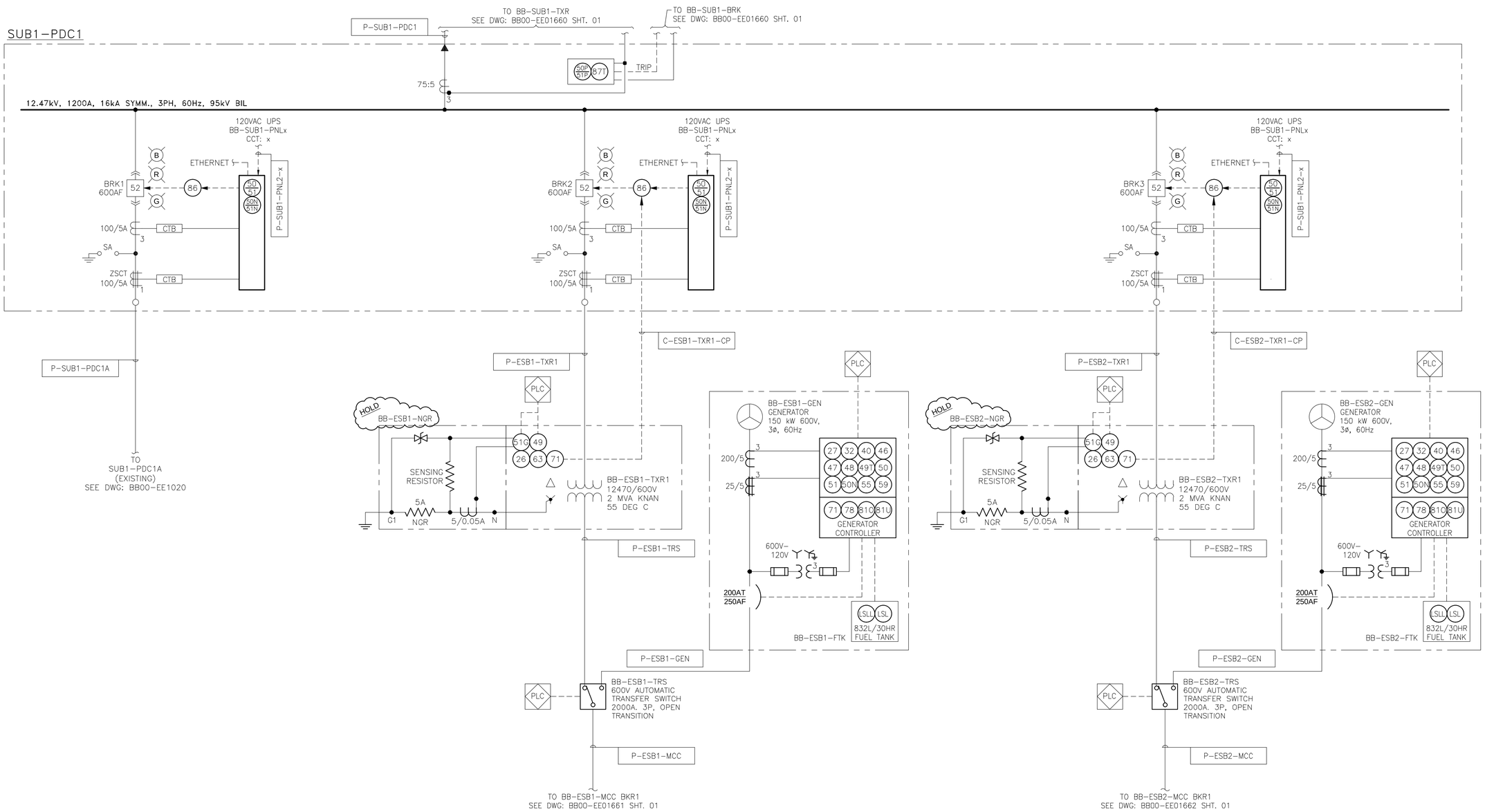
ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01–13283 (CH2M PROJ. #660356)	PB	RL	JE
			B	13DEC2016	RE–ISSUED FOR REVIEW AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANSMOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY J. ESTERER		DATE 2015/07/10

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01–13283	BB00 —	EE01660	01	C



ch2m:
11 JAN 2017
ISSUED
FOR
DESIGN

NOTE:
THIS DRAWING PREVIOUSLY ISSUED AS
PART OF BB00-EE01660, SHT 01 (REV. A)

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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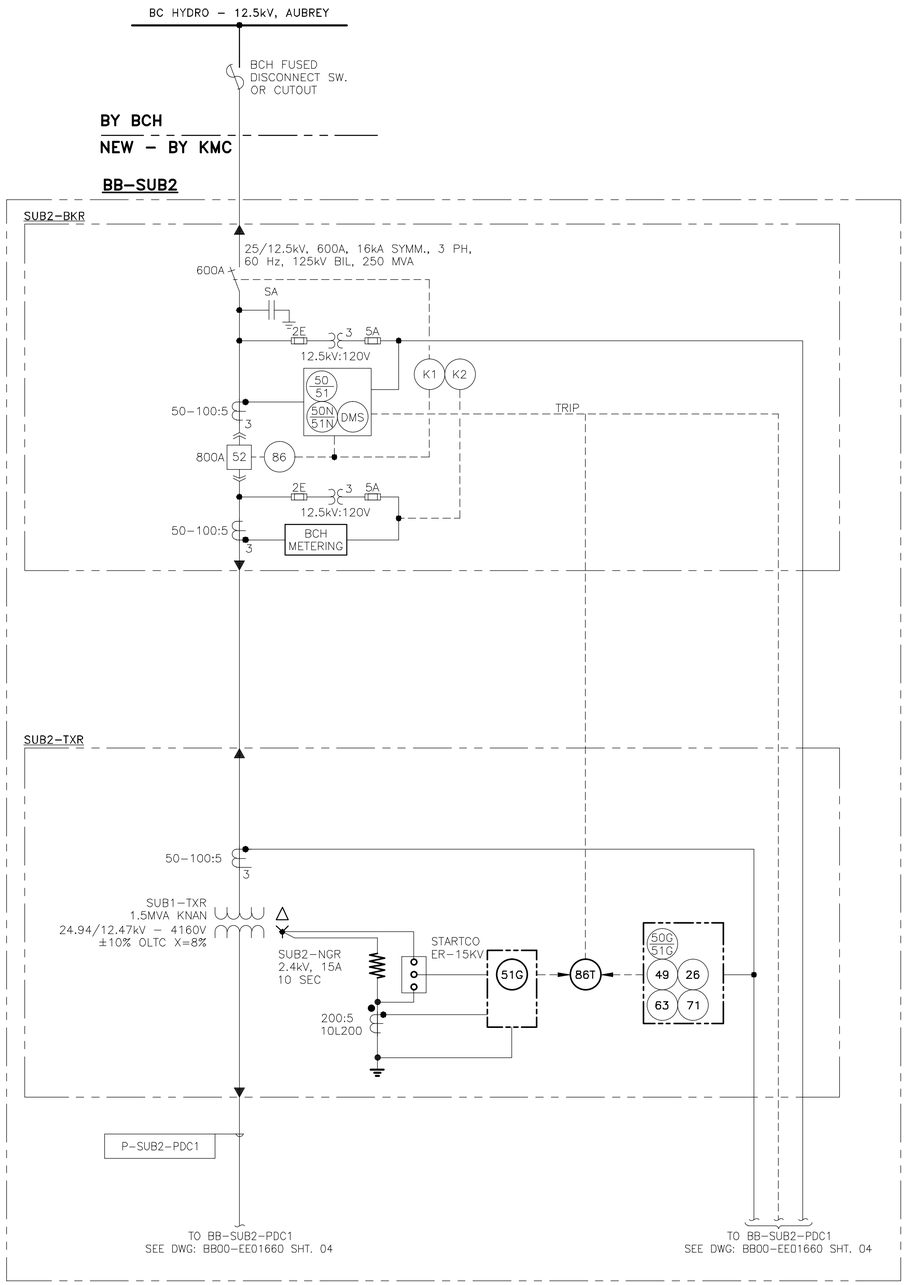
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY J. ESTERER		DATE 2015/07/10

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01660	02	C



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NOTE:
THIS DRAWING PREVIOUSLY ISSUED AS PART OF BB00–EE01660, SHT 02 (REV. A)

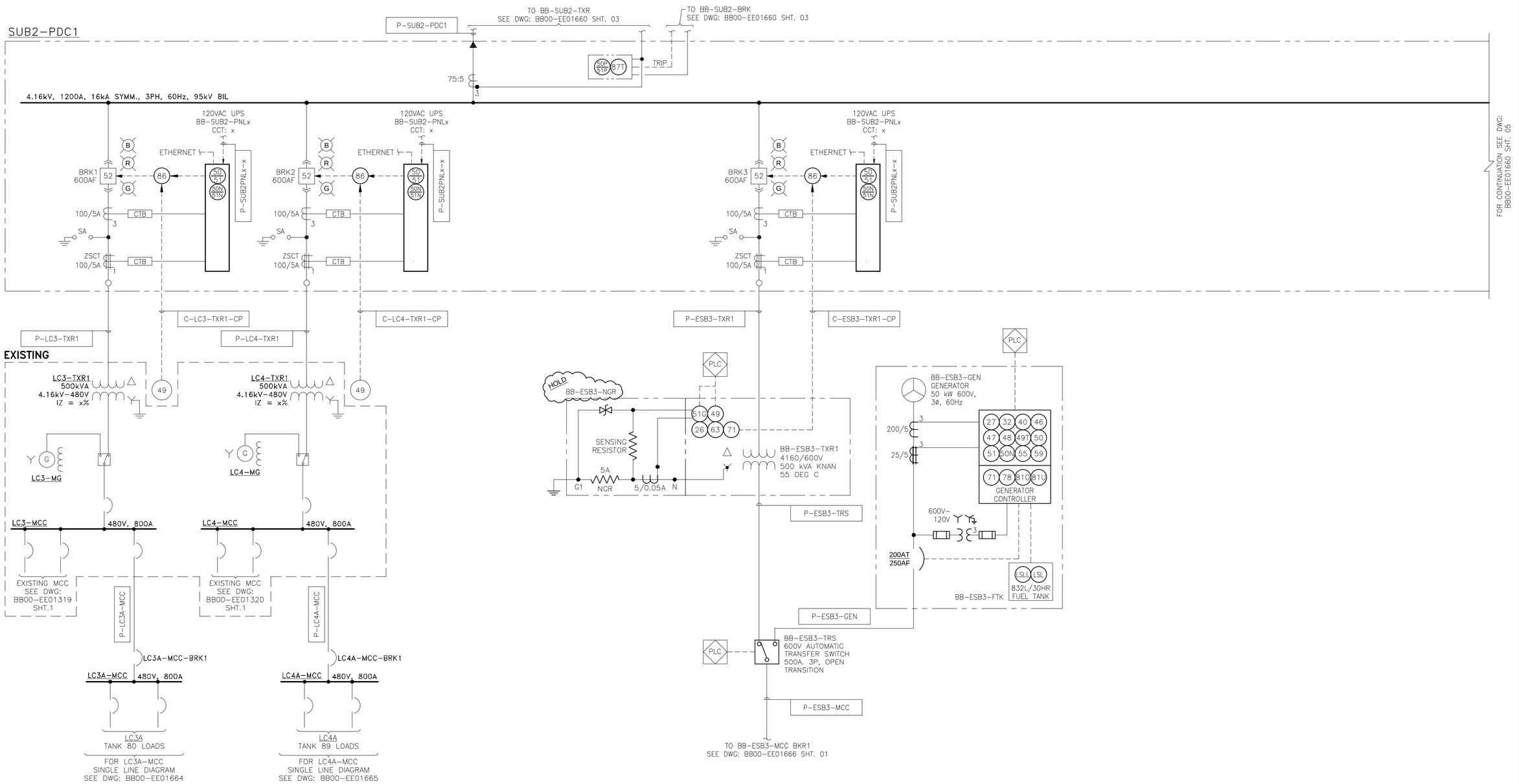
NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.

NO	DATE	REVISION	DRN	CHK	APPR
B	11JAN2017	ISSUED FOR DESIGN AFE #01–13283 (CH2M PROJ. #660356)	PB	RL	JE
A	13DEC2016	ISSUED FOR REVIEW AFE #01–13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANSMOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY J. ESTERER		DATE 2016/05/26

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01–13283	BB00	EE01660	03	B



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11 JAN 2017
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FOR
DESIGN

NOTE:
THIS DRAWING PREVIOUSLY ISSUED AS
PART OF BB00-EE01660, SHT 02 (REV. A)

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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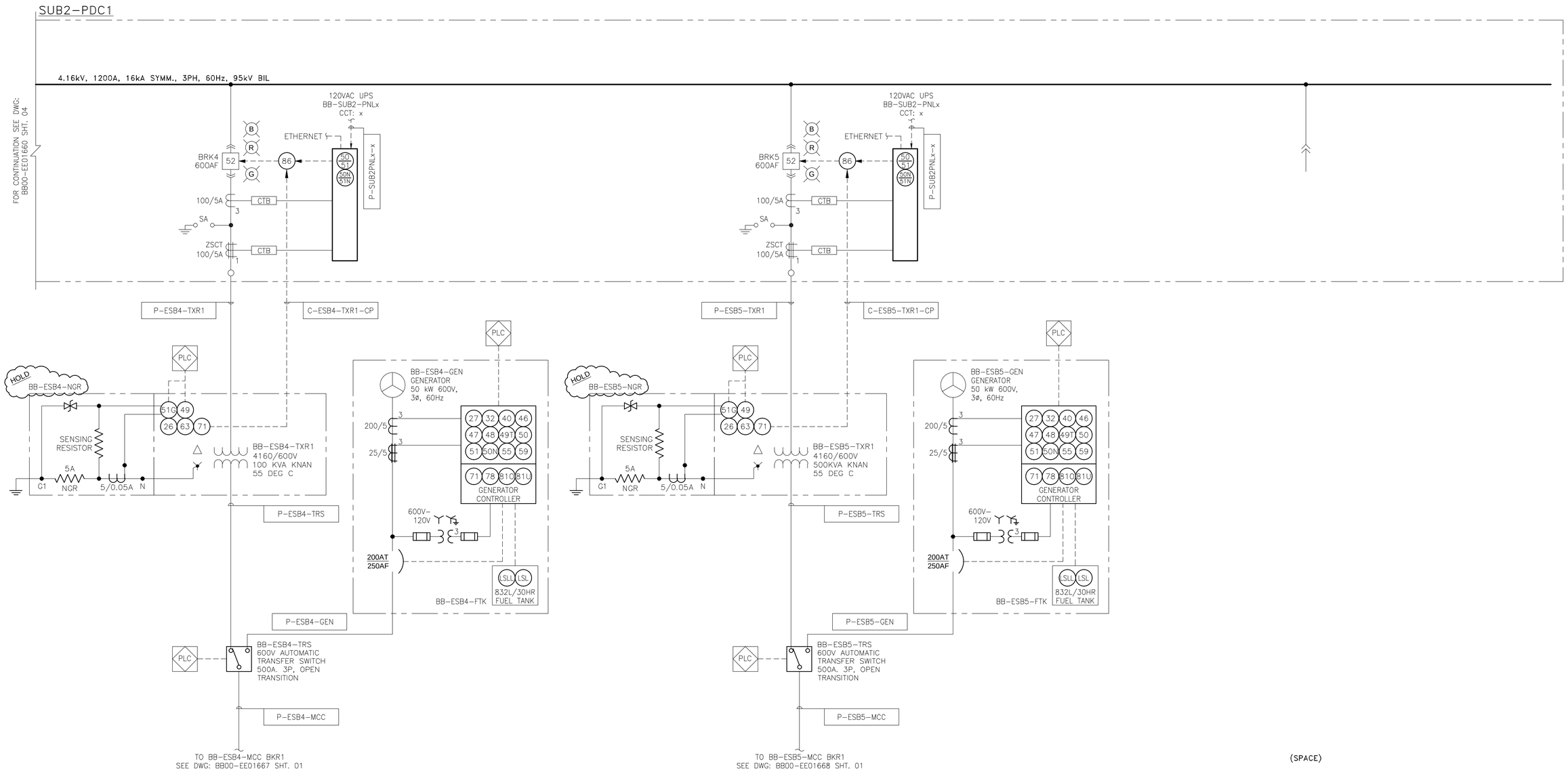
			A	13DEC2016	ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY J. ESTERER		DATE 2016/05/26

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00	EE01660	04	B



ch2m
11 JAN 2017
ISSUED FOR DESIGN

NOTE:
THIS DRAWING PREVIOUSLY ISSUED AS PART OF BB00-EE01660, SHT 02 (REV. A)

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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			A	13DEC2016	ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM TERMINAL WIDE OVERVIEW POWER DISTRIBUTION TANK FARM BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY J. ESTERER		DATE 2016/05/26

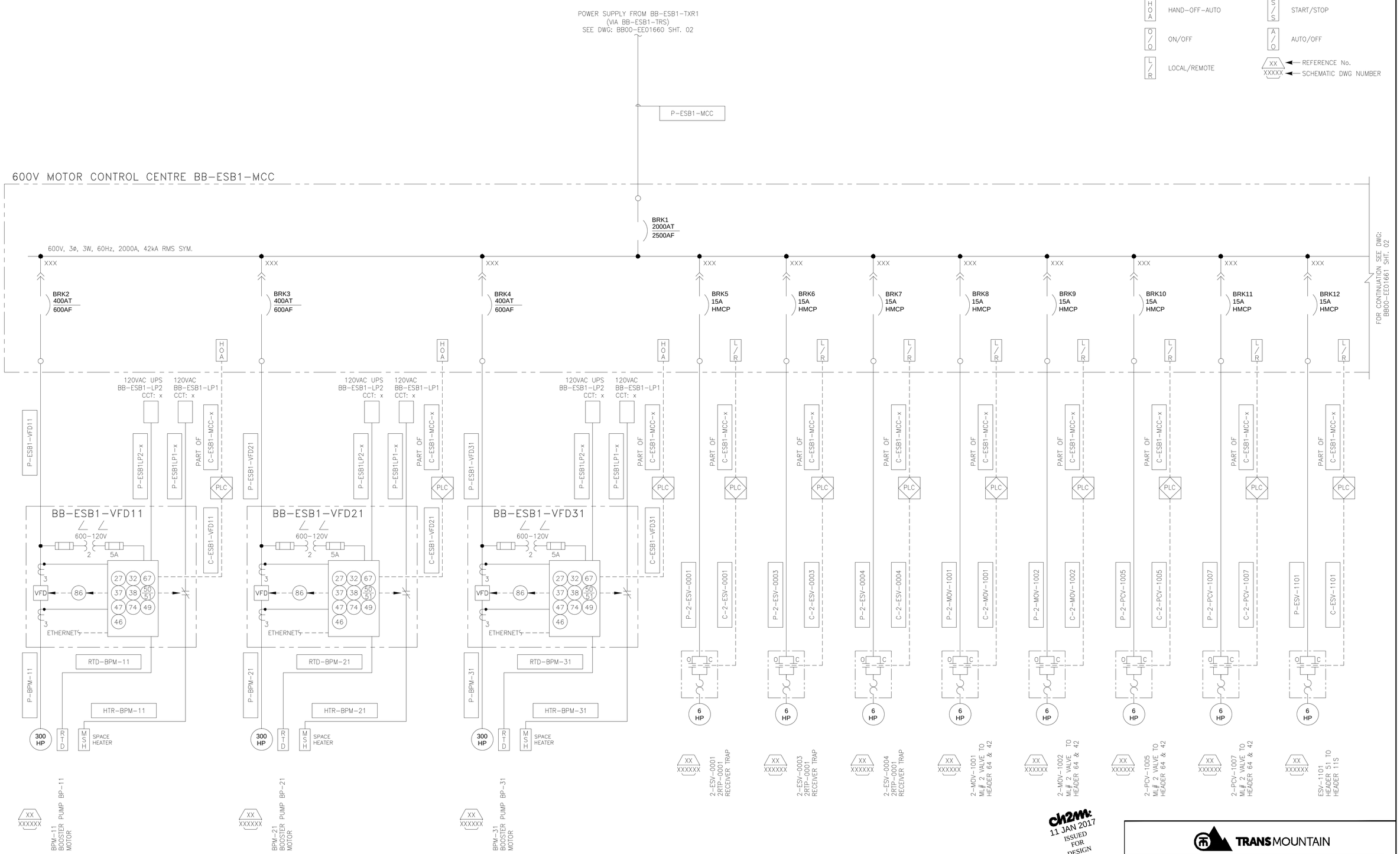
PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00	EE01660	05	B

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB1-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO
O / O	ON/OFF
L / R	LOCAL/REMOTE
S / S	START/STOP
A / O	AUTO/OFF
XX	REFERENCE No.
XXXXX	SCHEMATIC DWG NUMBER



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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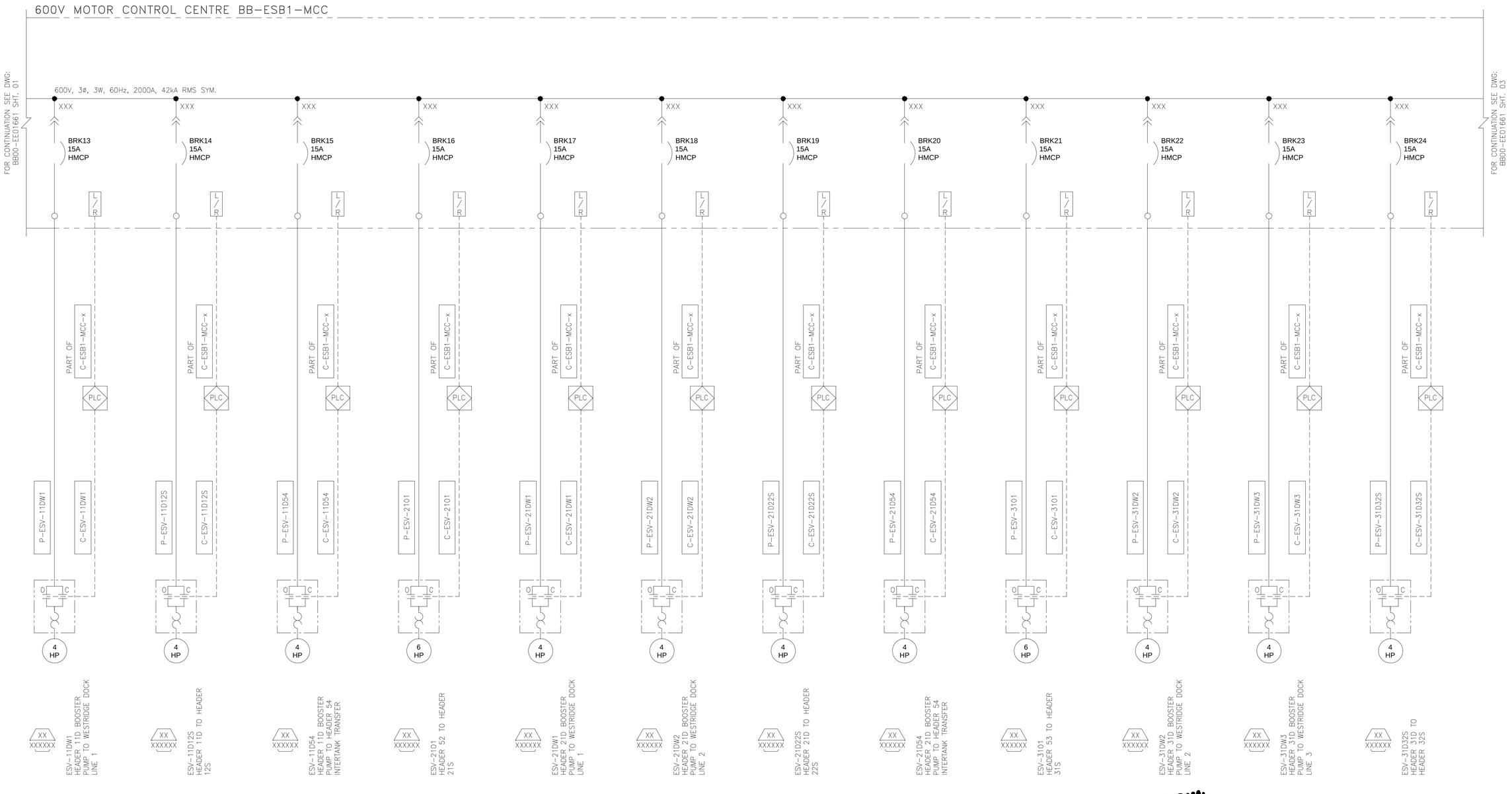
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01661	01	C



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO.	DATE	REVISION	DRN	CHK	APPR
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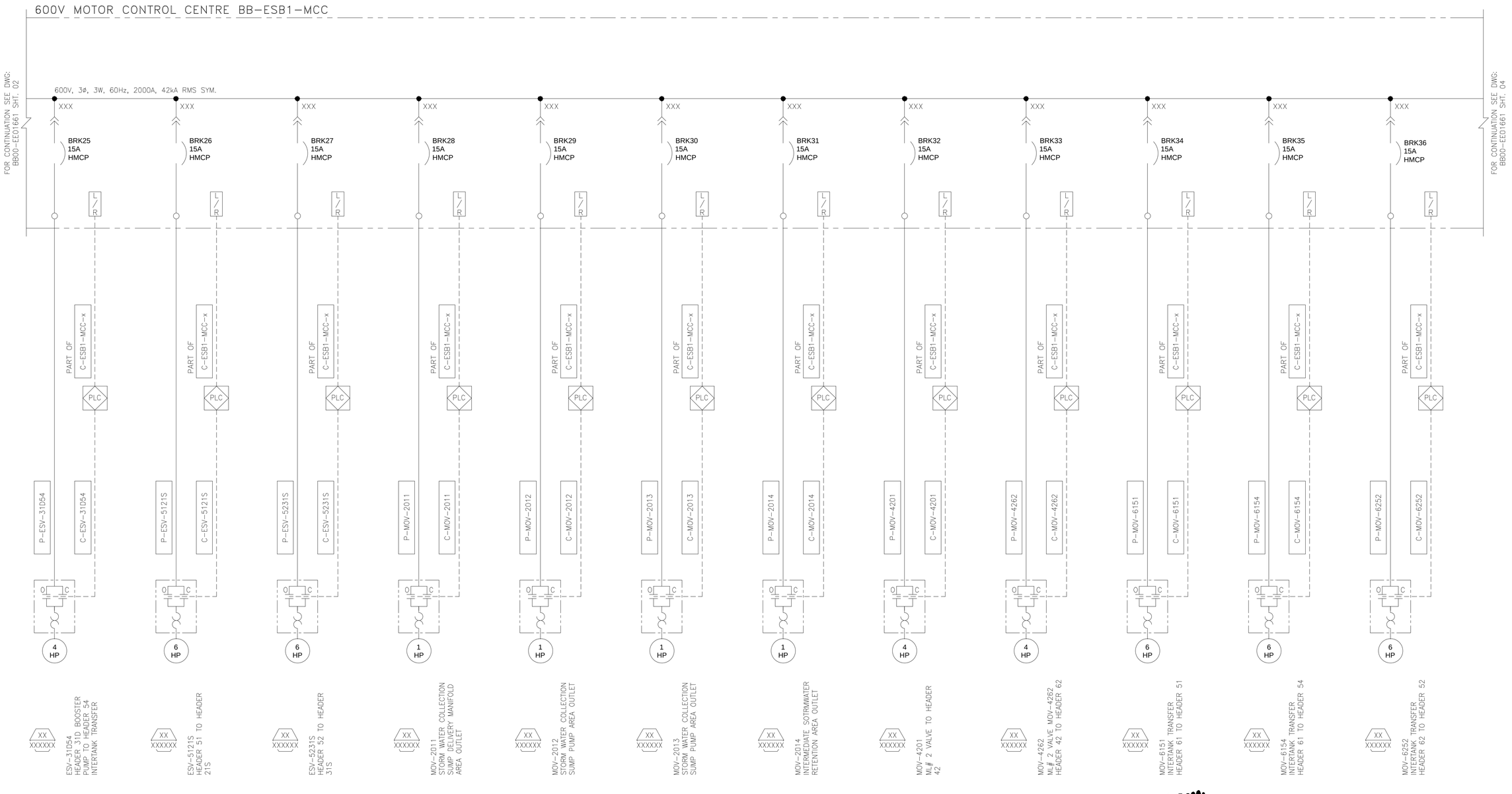
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01661	02	C



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NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO.	DATE	REVISION	DRN	CHK	APPR
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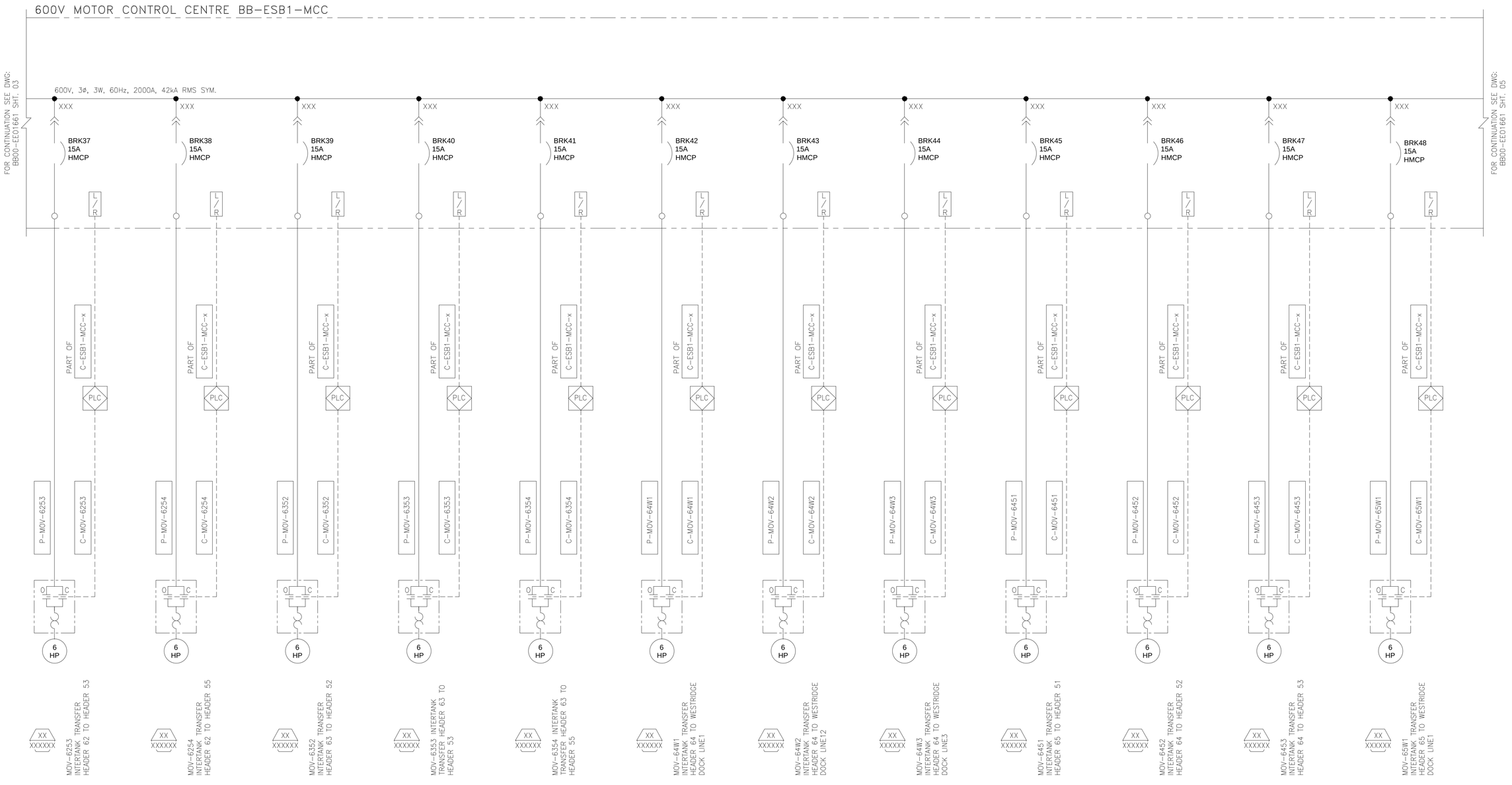
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01661	03	C



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO.	DATE	REVISION	DRN	CHK	APPR
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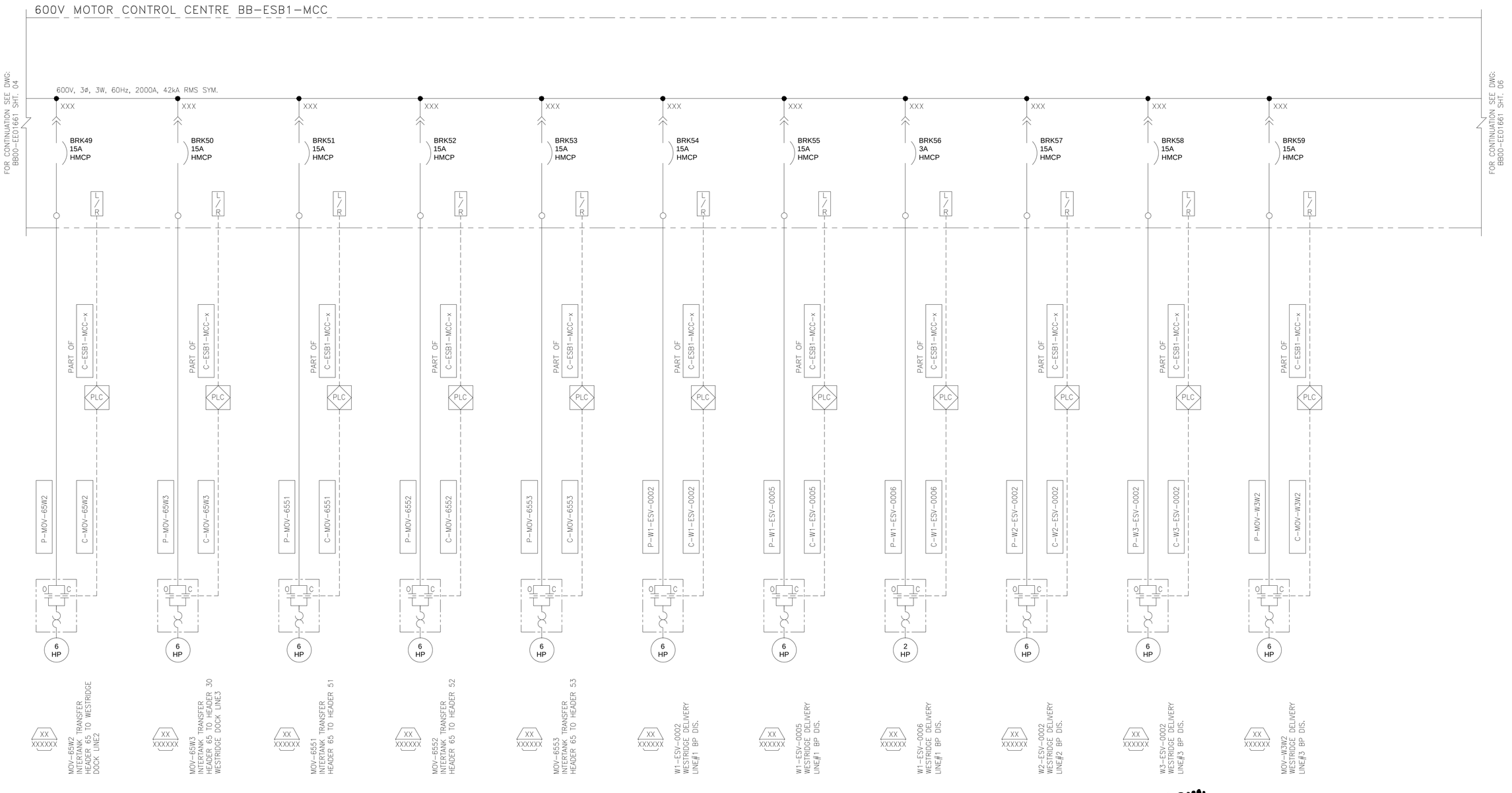
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01661	04	C



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO.	DATE	REVISION	DRN	CHK	APPR
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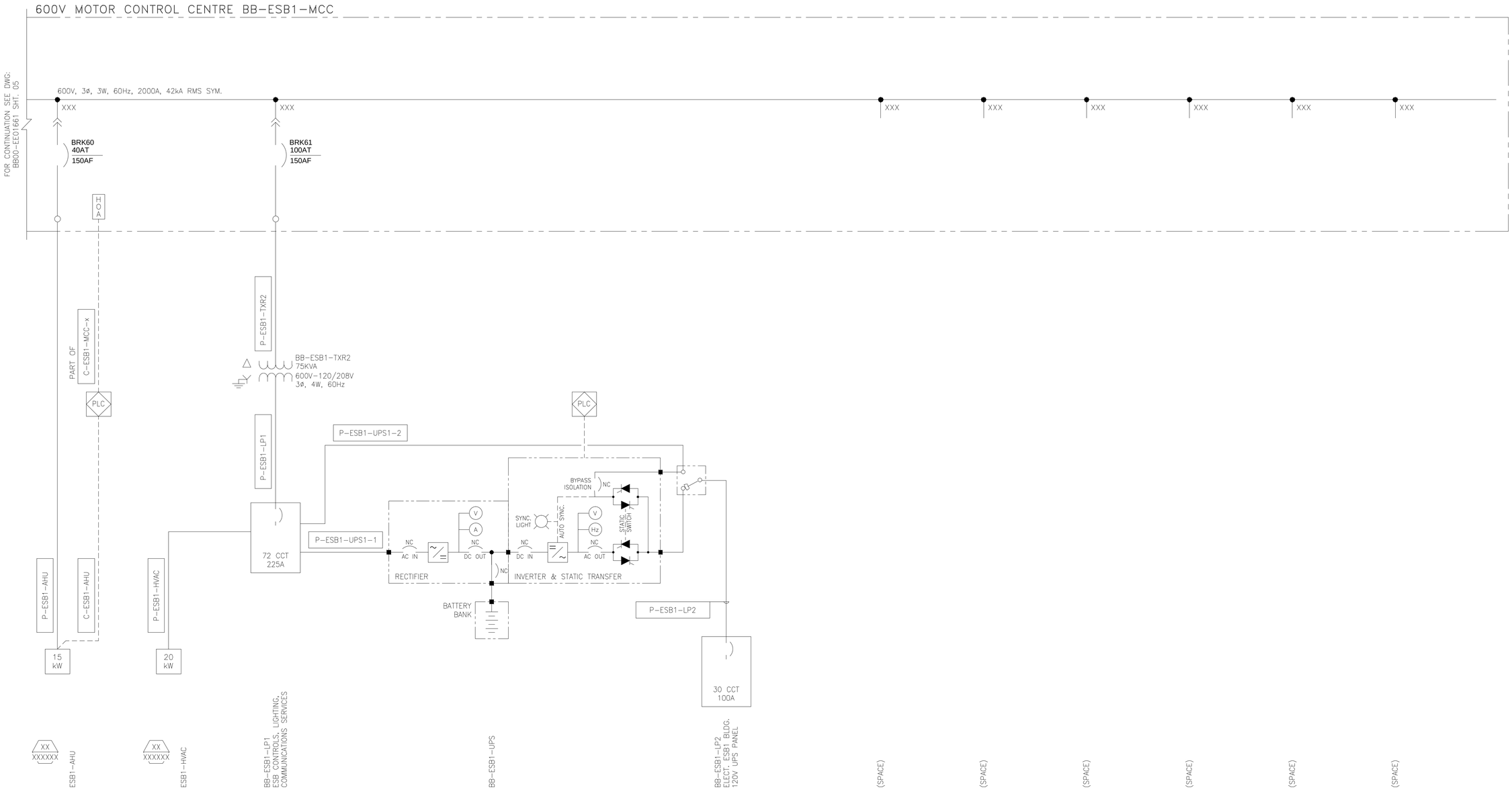
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01661	05	C



ch2m
11 JAN 2017
ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB1-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

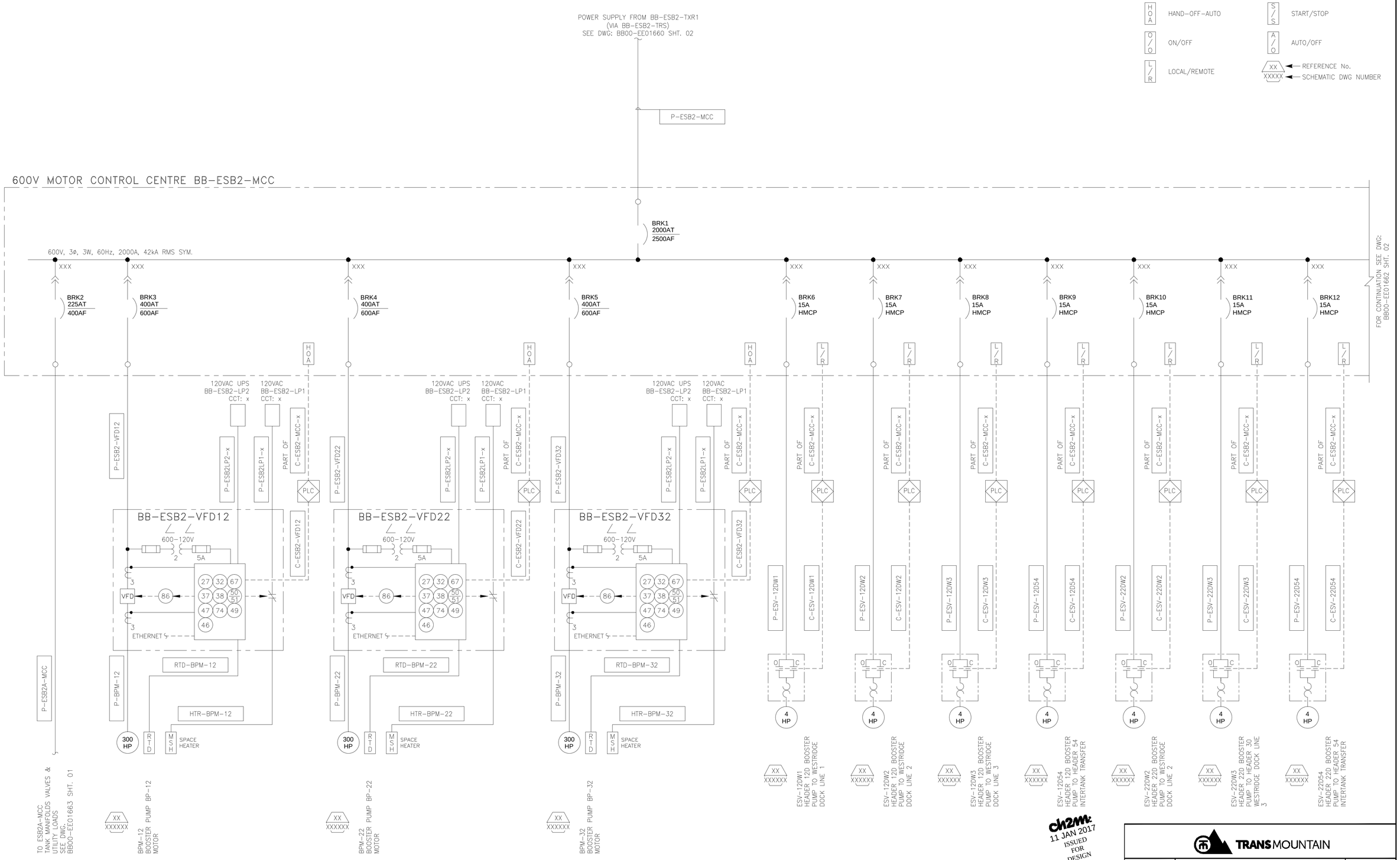
PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01661	06	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB2-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO
O / O	ON/OFF
L / R	LOCAL/REMOTE
S / S	START/STOP
A / O	AUTO/OFF
XX	REFERENCE No.
XXXXX	SCHEMATIC DWG NUMBER



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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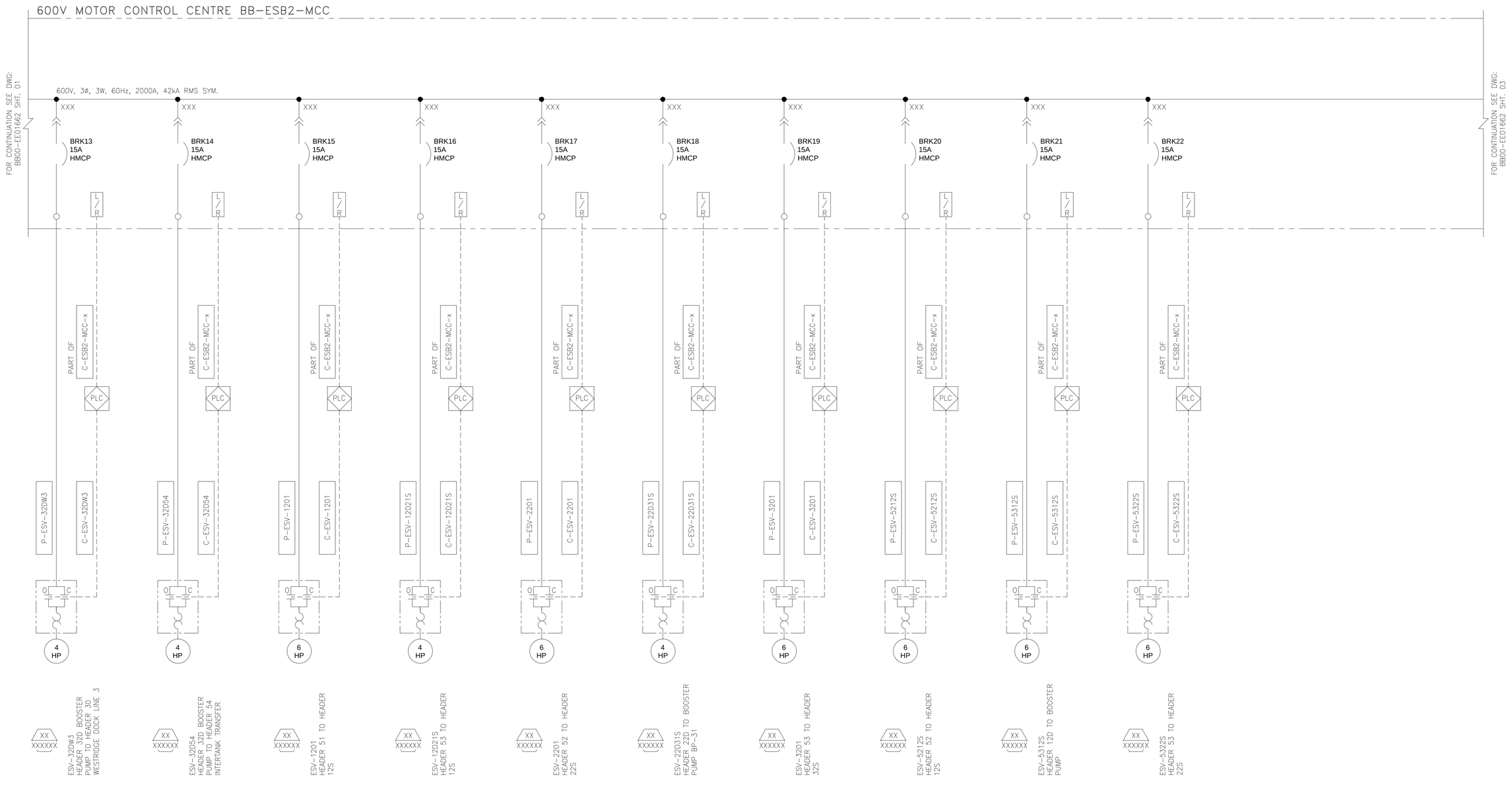
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01662	01	C



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO.	DATE	REVISION	DRN	CHK	APPR
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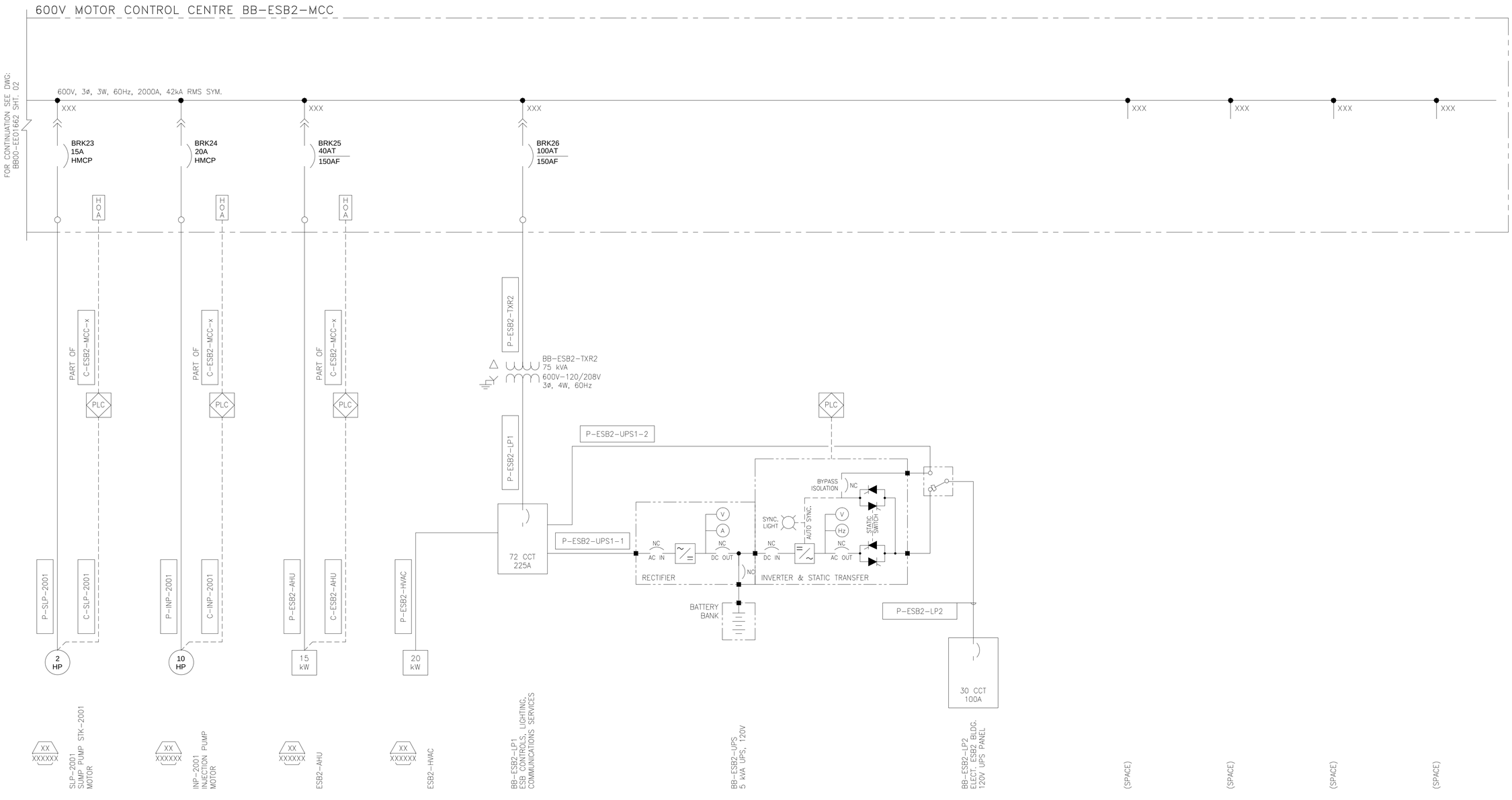
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01662	02	C



ch2m: 11 JAN 2017 ISSUED FOR DESIGN

NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION ESB2-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

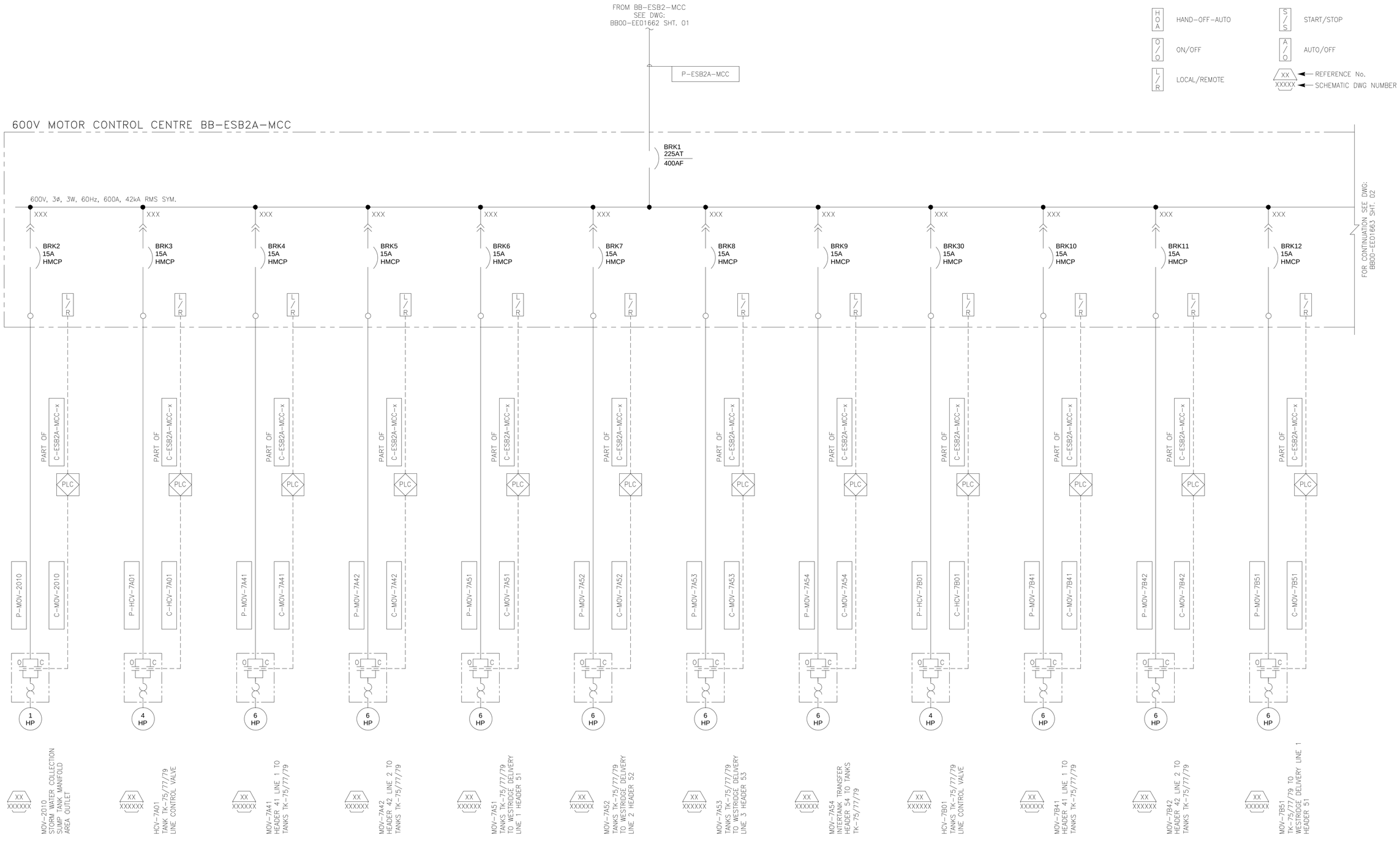
PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01662	03	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB2A-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO	S / S	START/STOP
O / O	ON/OFF	A / O	AUTO/OFF
L / R	LOCAL/REMOTE	XX ← REFERENCE No. XXXXX ← SCHEMATIC DWG NUMBER	



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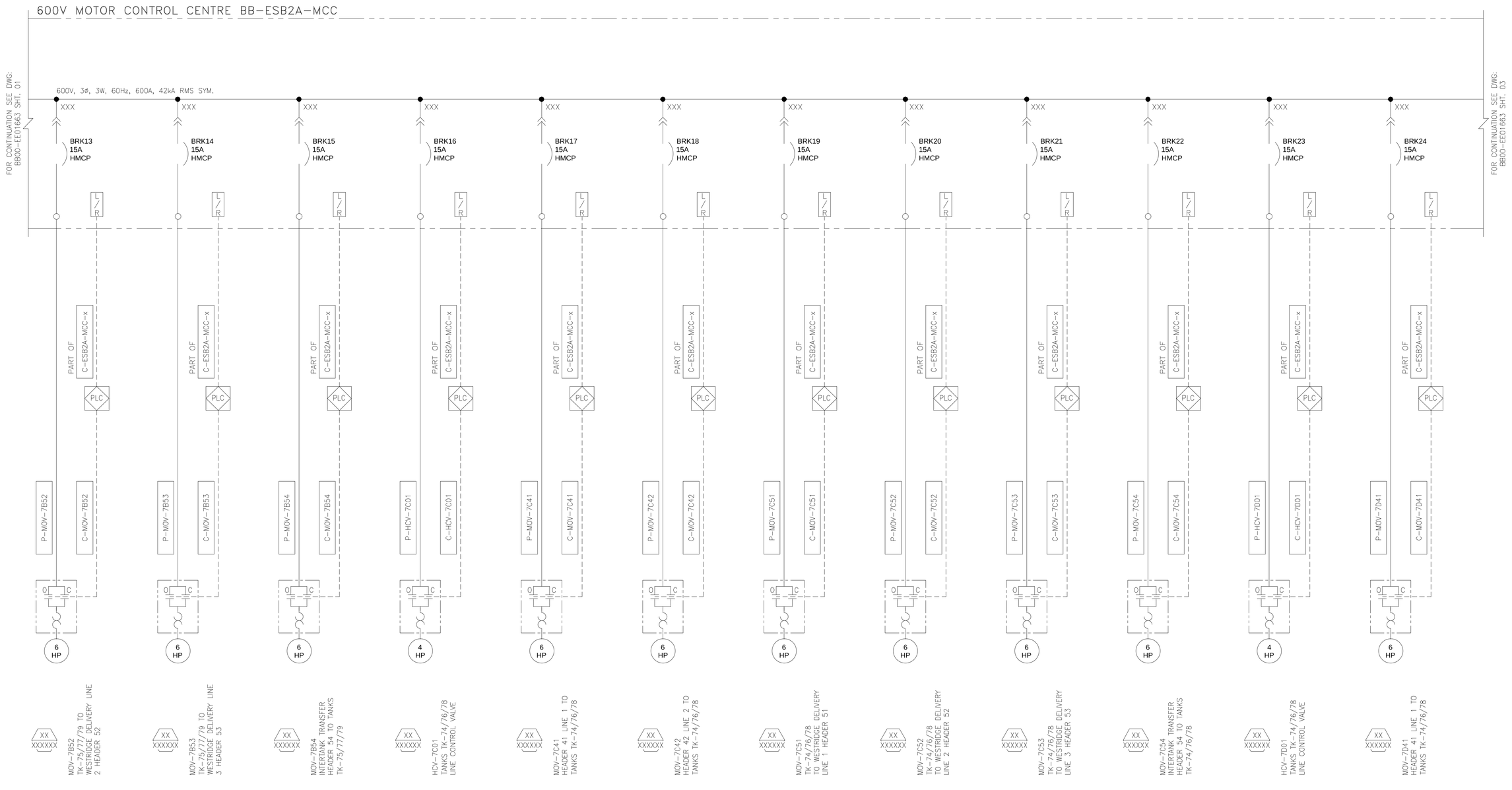
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01663	01	C



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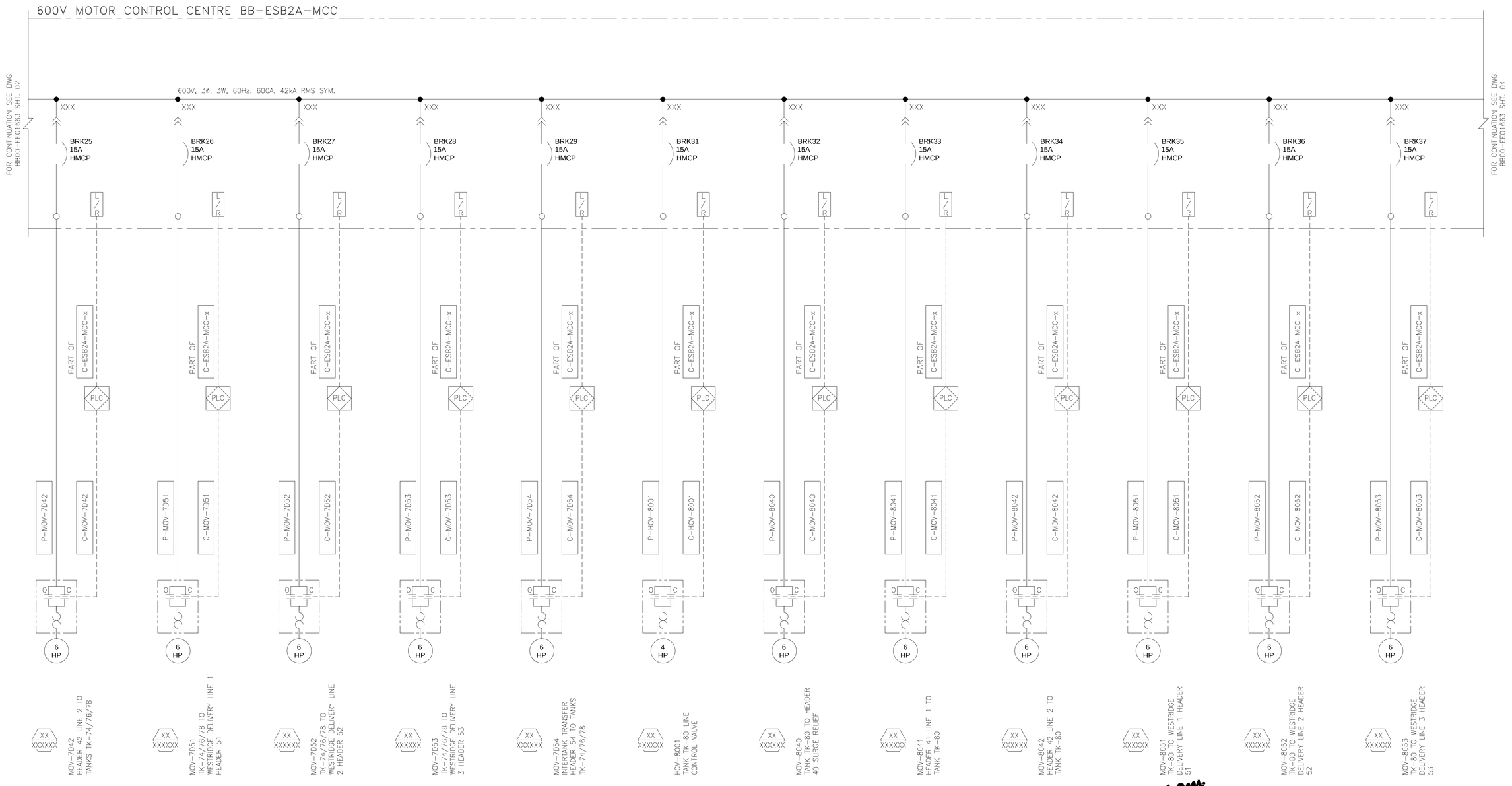
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01663	02	C



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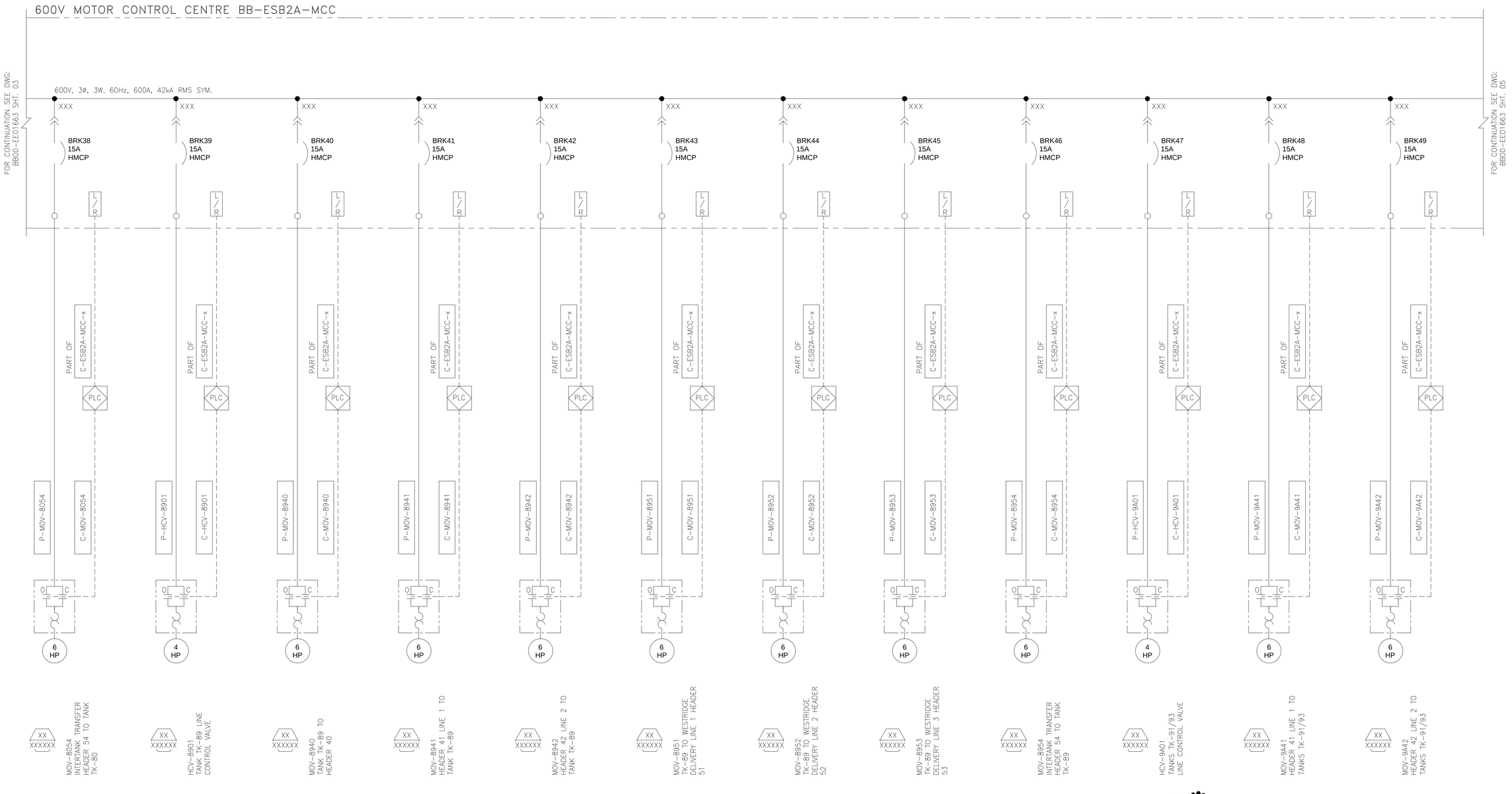
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01663	03	C



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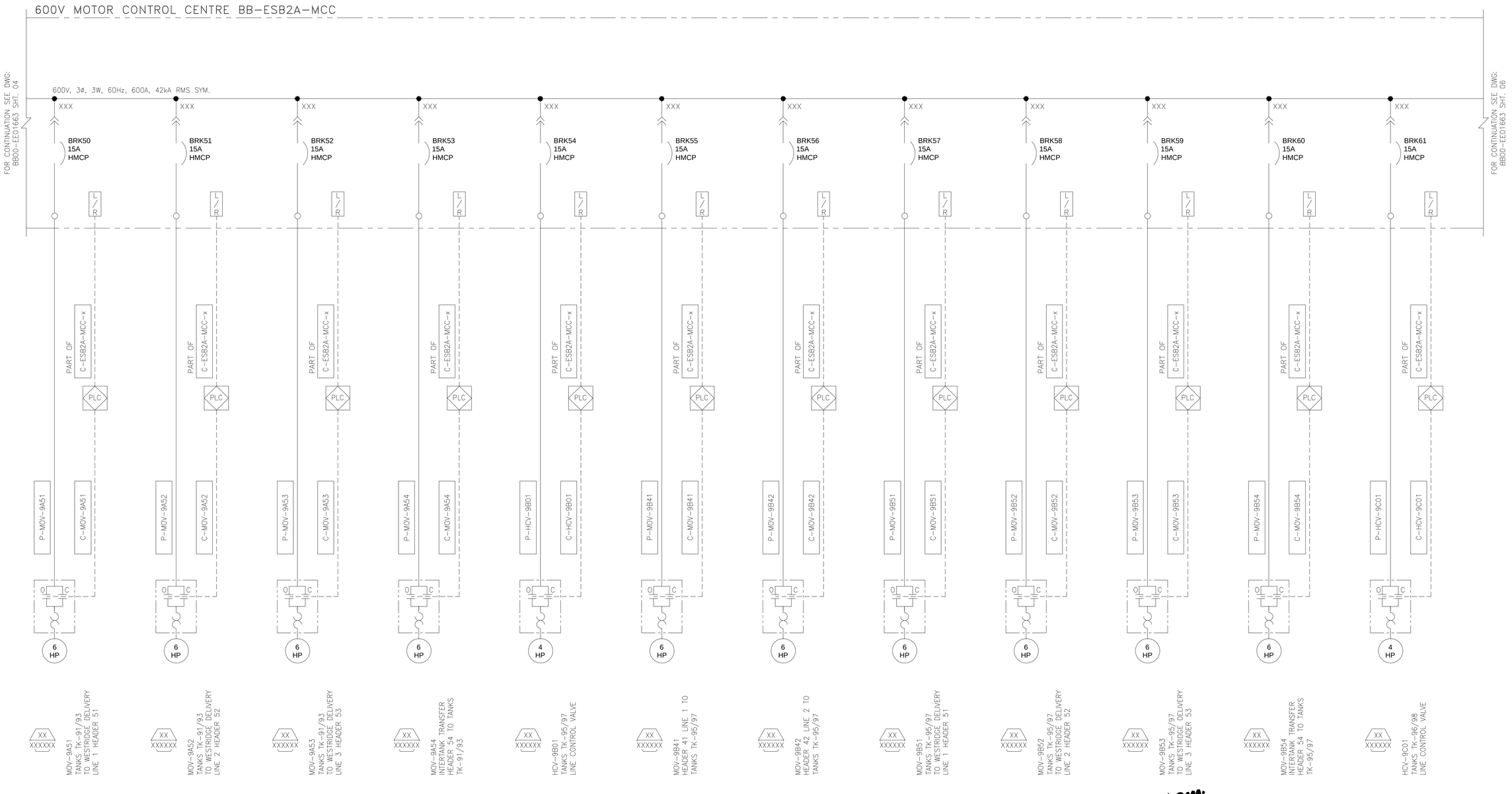
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01663	04	C



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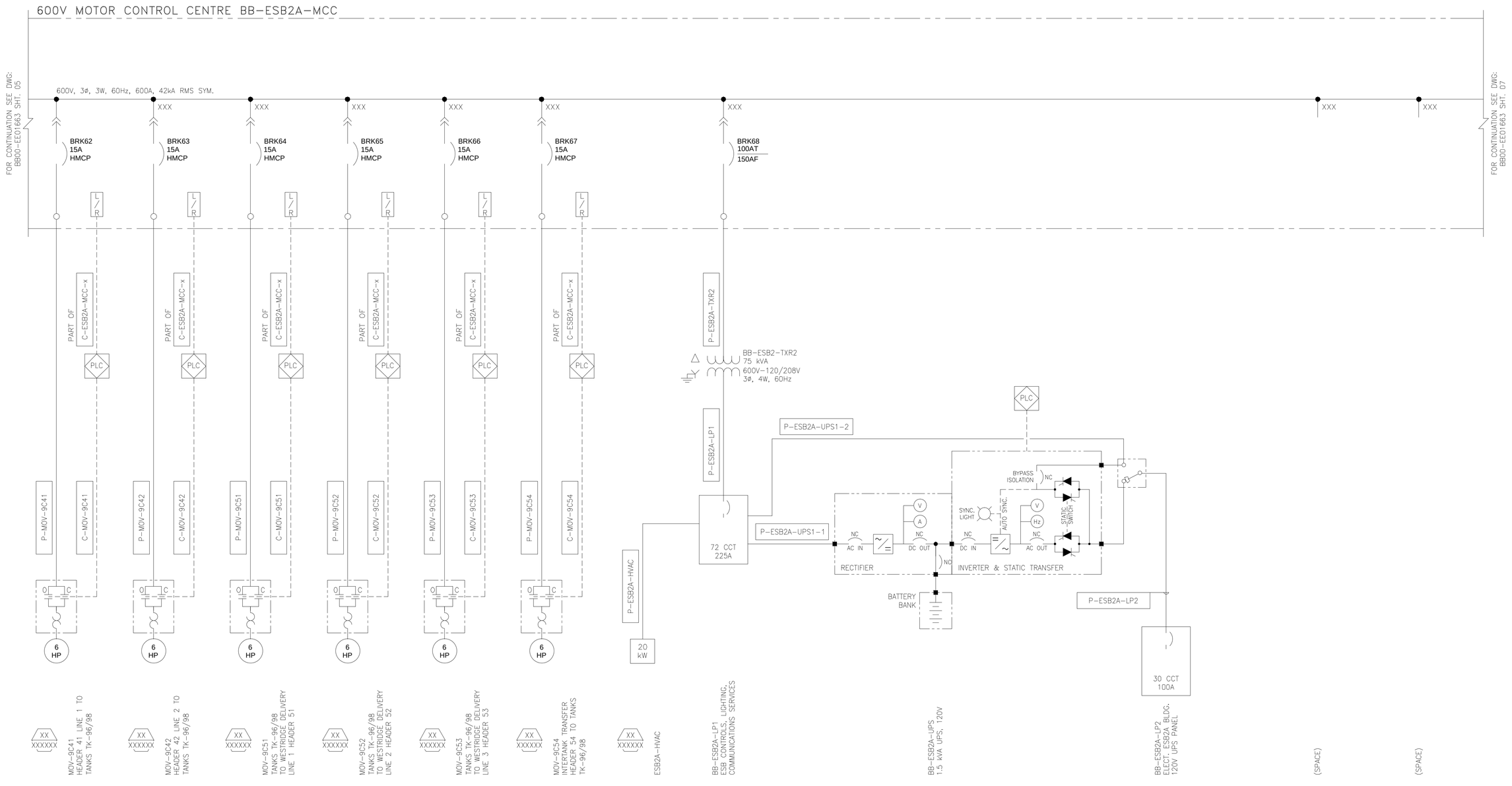
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01663	05	C



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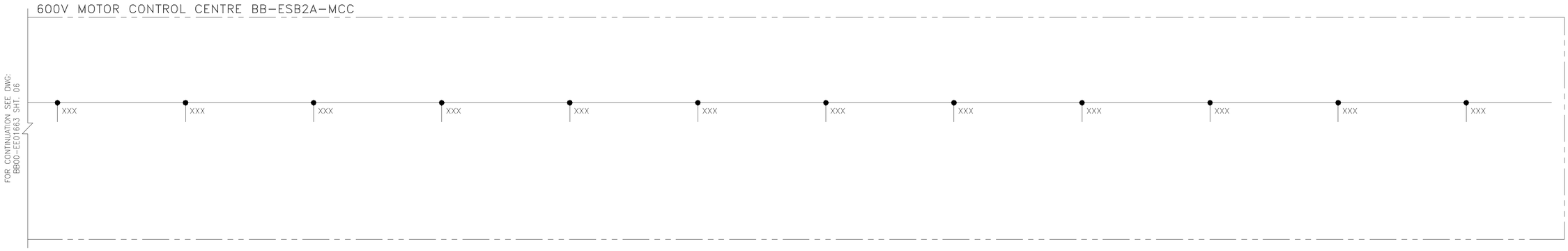
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00	EE01663	06	C



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			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB2A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

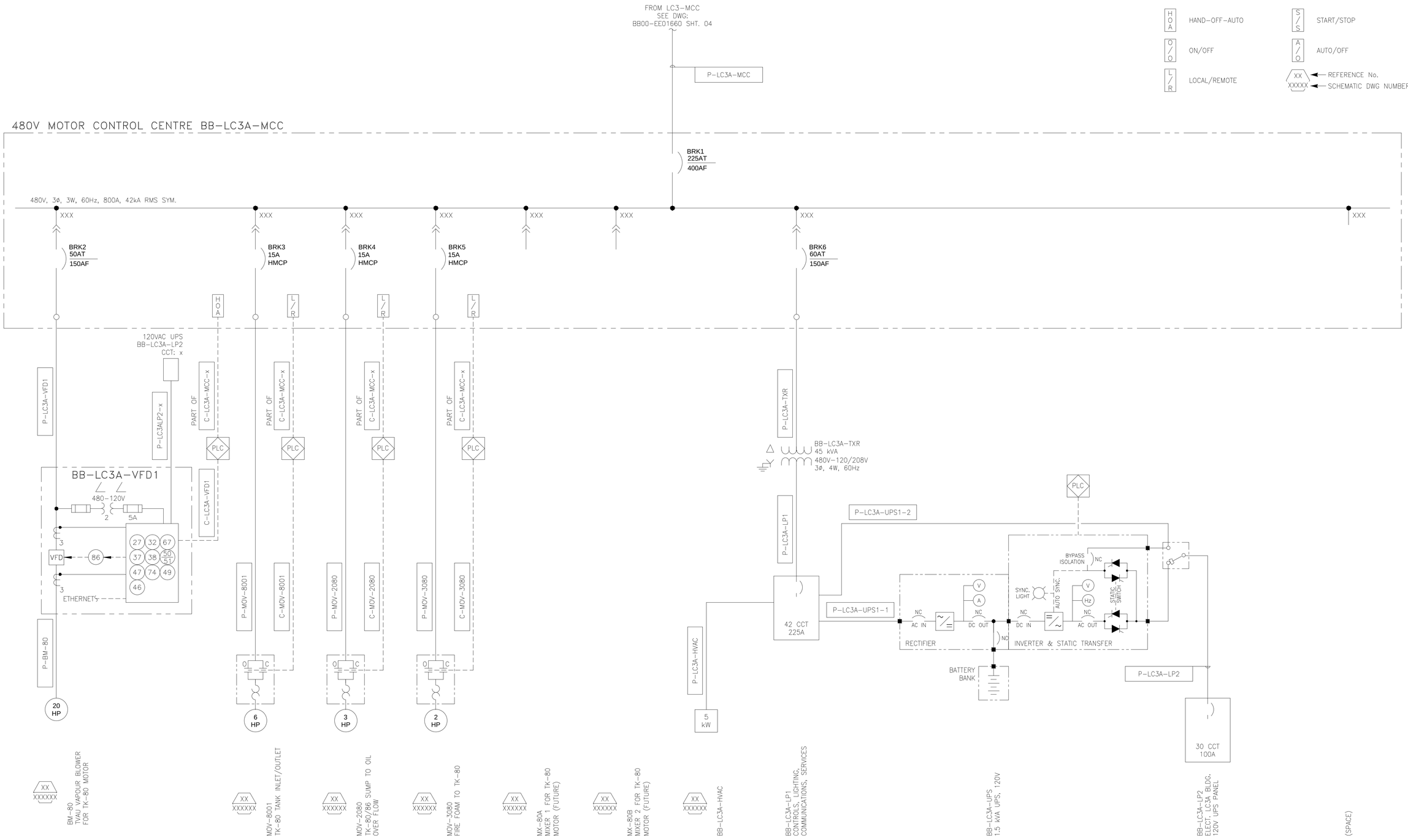
PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01663	07	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "LC3A-MCC-".

LEGEND:

- HOA — HAND-OFF-AUTO
- S/S — START/STOP
- O/O — ON/OFF
- A/O — AUTO/OFF
- L/R — LOCAL/REMOTE
- XX — REFERENCE No.
- XXXXX — SCHEMATIC DWG NUMBER



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NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 480 VOLT DISTRIBUTION BB-LC3A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01664	01	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "LC4A-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO	S / S	START/STOP
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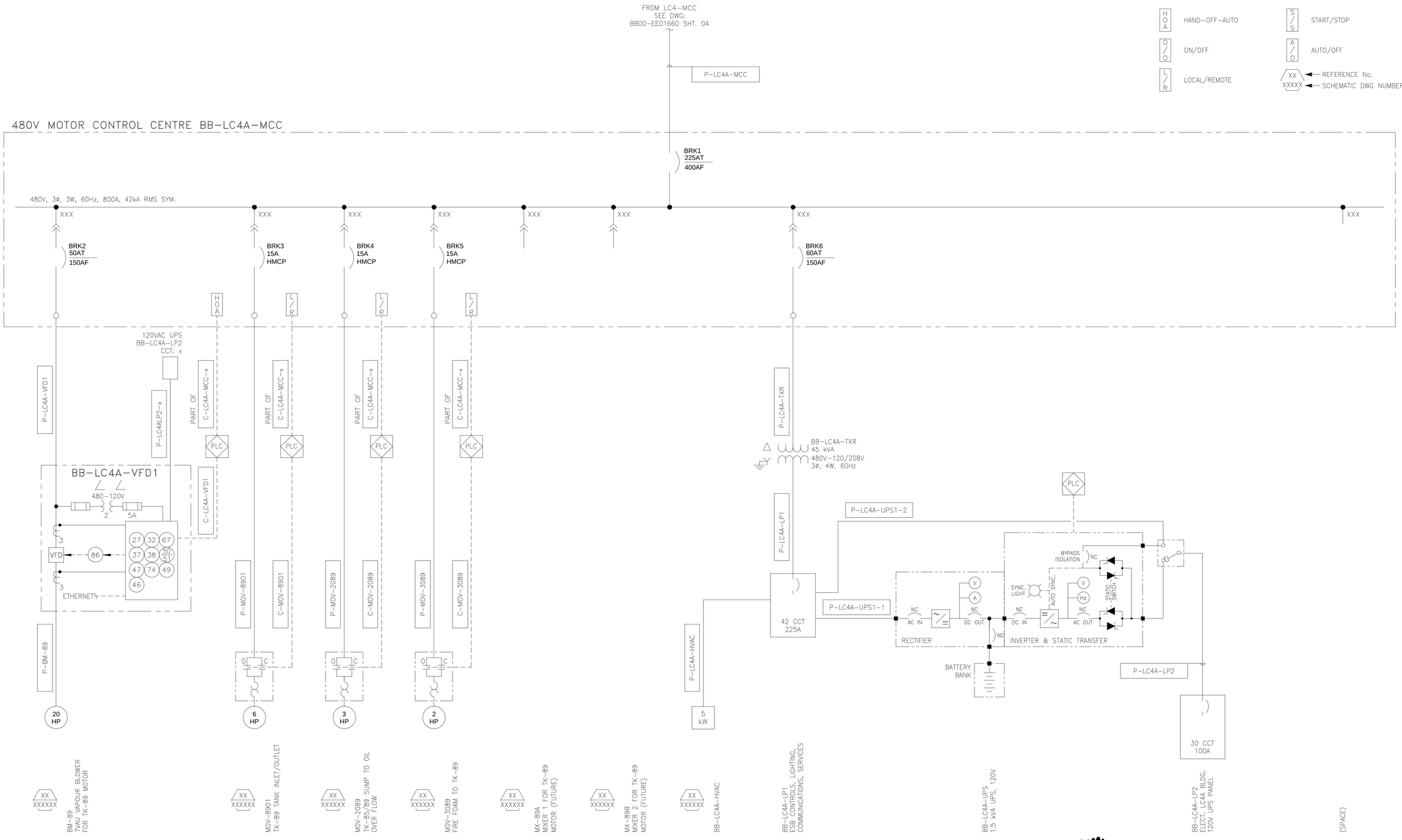
L / R	LOCAL/REMOTE	XX / XXXXX	REFERENCE No. / SCHEMATIC DWG NUMBER



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NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
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			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 480 VOLT DISTRIBUTION BB-LC4A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

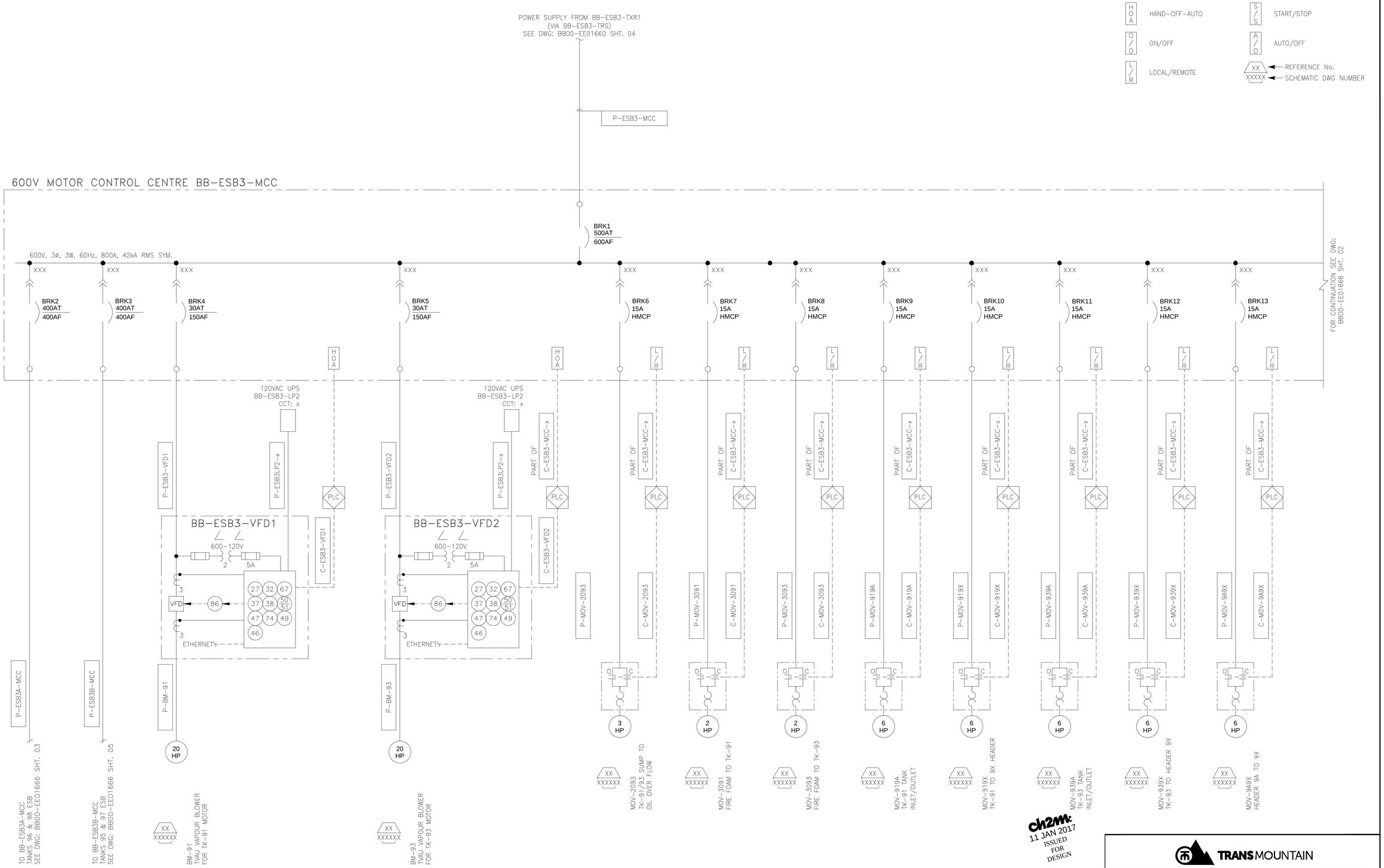
PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01665	01	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB3-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO	S / S	START/STOP
O / O	ON/OFF	A / O	AUTO/OFF
L / R	LOCAL/REMOTE	XX / XXXXX	REFERENCE No. / SCHEMATIC DWG NUMBER



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			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
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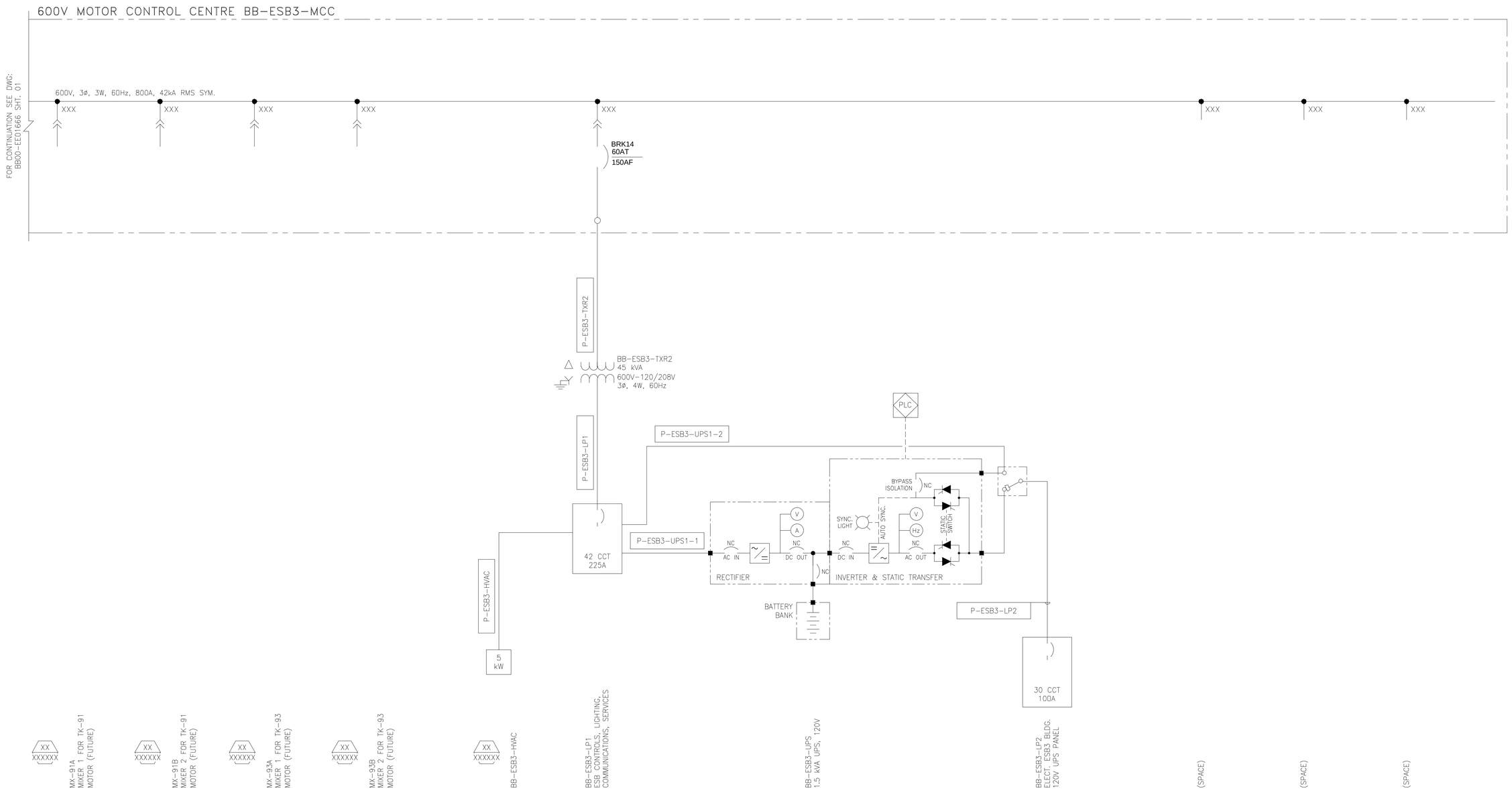

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TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB3-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

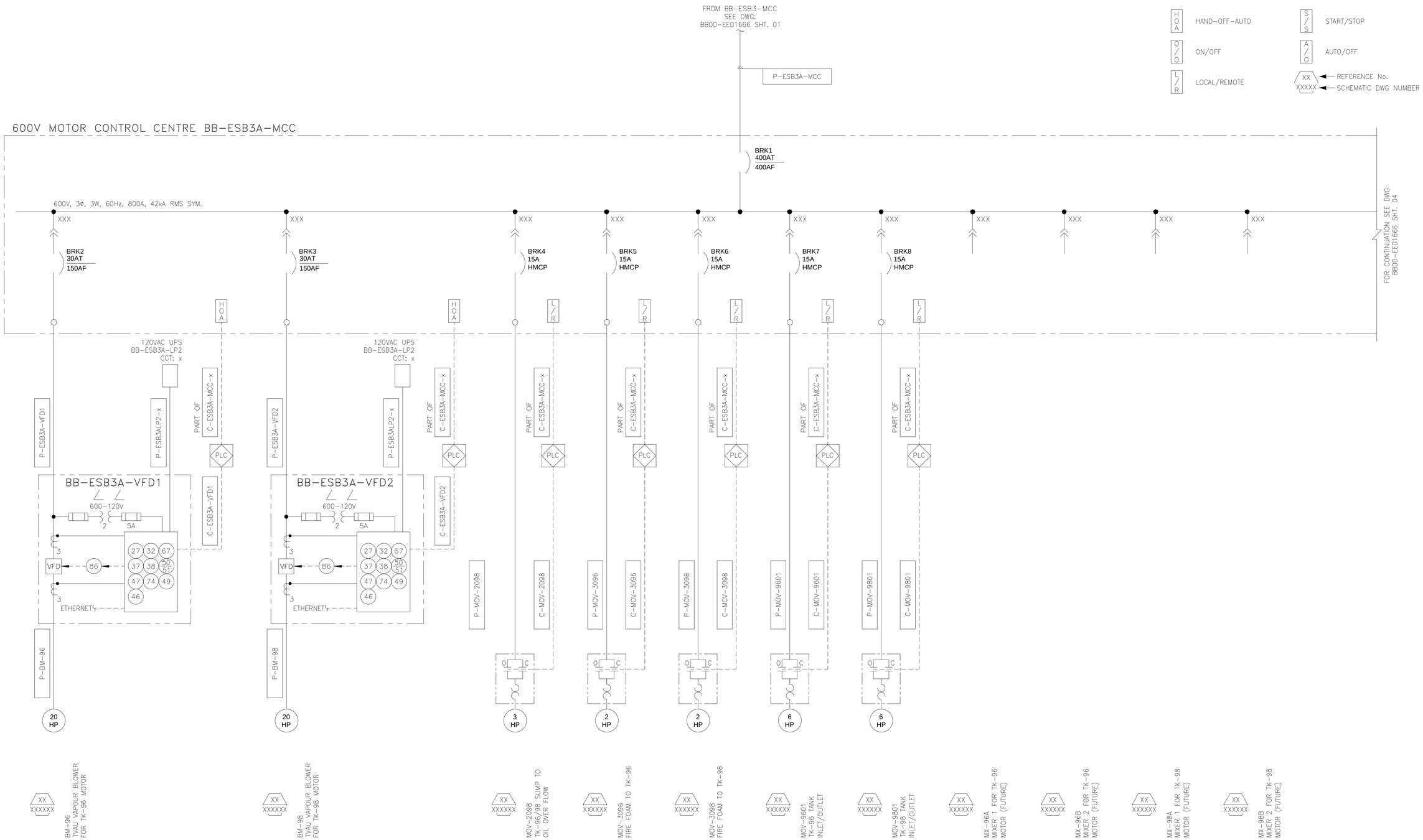
PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01666	02	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB3A-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO	S / S	START/STOP
O / O	ON/OFF	A / O	AUTO/OFF
L / R	LOCAL/REMOTE	XX ← REFERENCE No. XXXXX ← SCHEMATIC DWG NUMBER	



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TRANS MOUNTAIN

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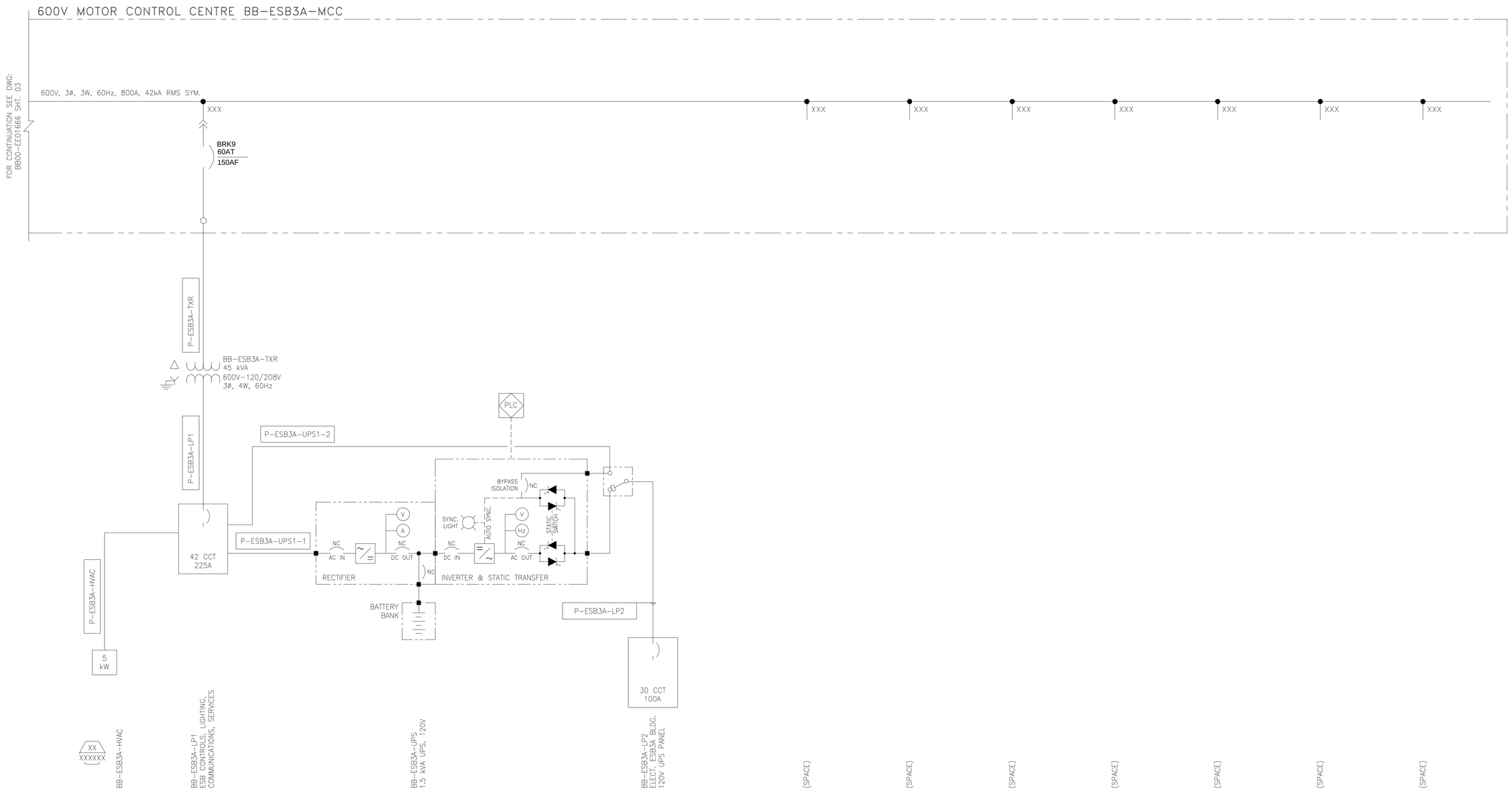
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01666	03	C



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TRANS MOUNTAIN

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CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01666	04	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB3B-MCC-".

LEGEND:

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L / R	LOCAL/REMOTE
S / S	START/STOP
A / O	AUTO/OFF
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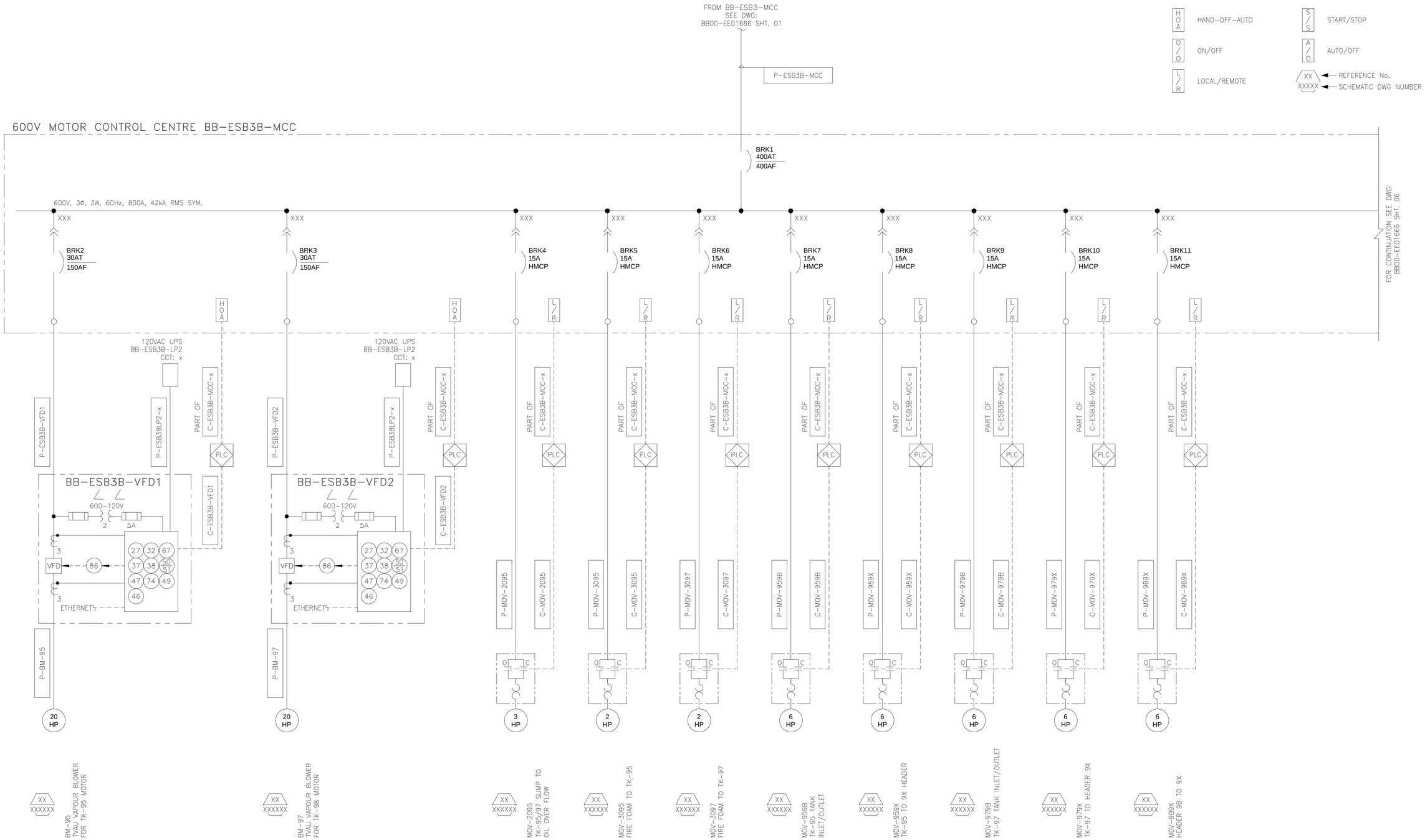

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TRANS MOUNTAIN

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CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
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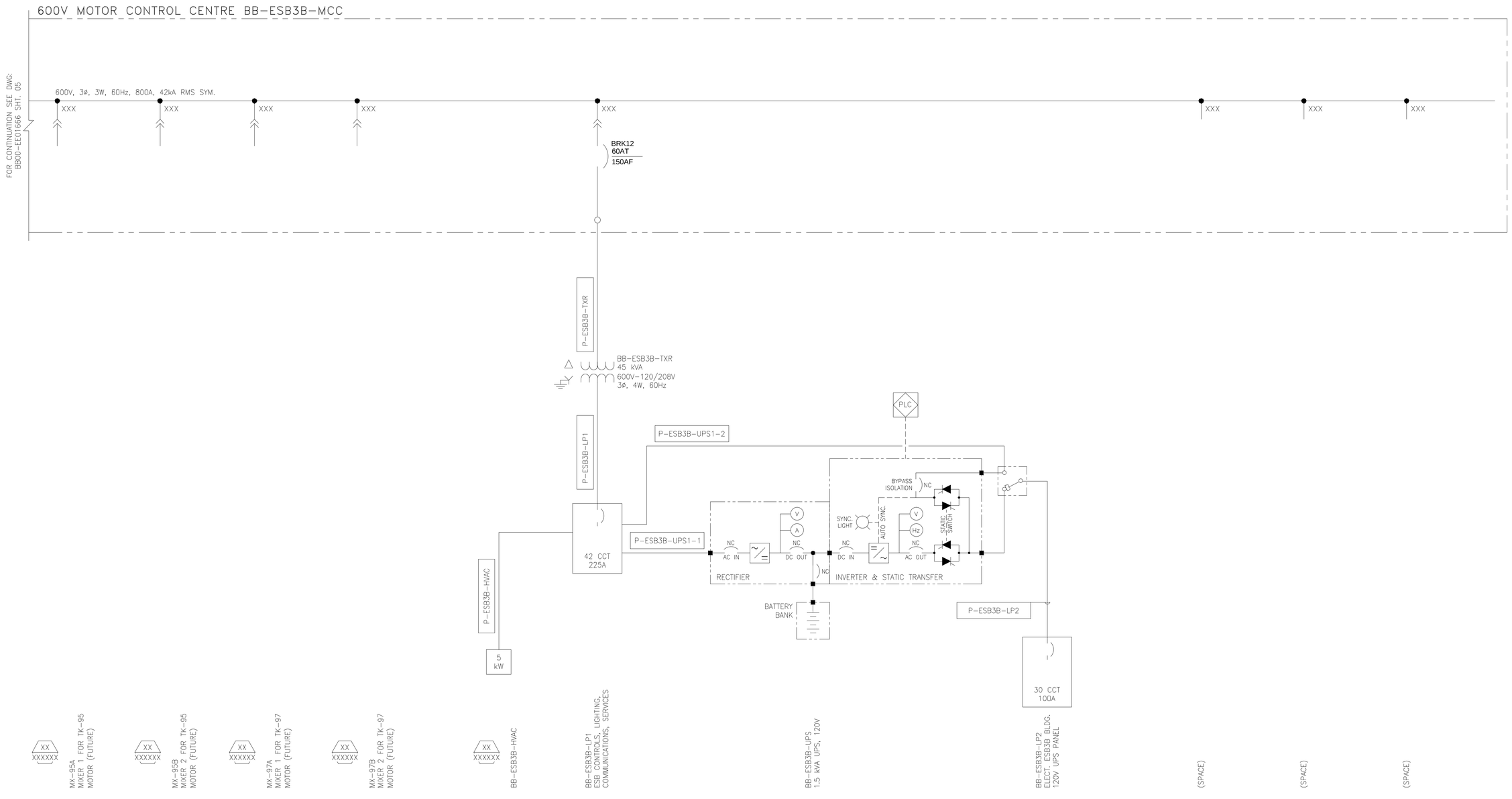

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TRANS MOUNTAIN

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CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01666	06	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB4-MCC-".

LEGEND:

H/O/A	HAND-OFF-AUTO
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L/R	LOCAL/REMOTE
S/S	START/STOP
A/O	AUTO/OFF
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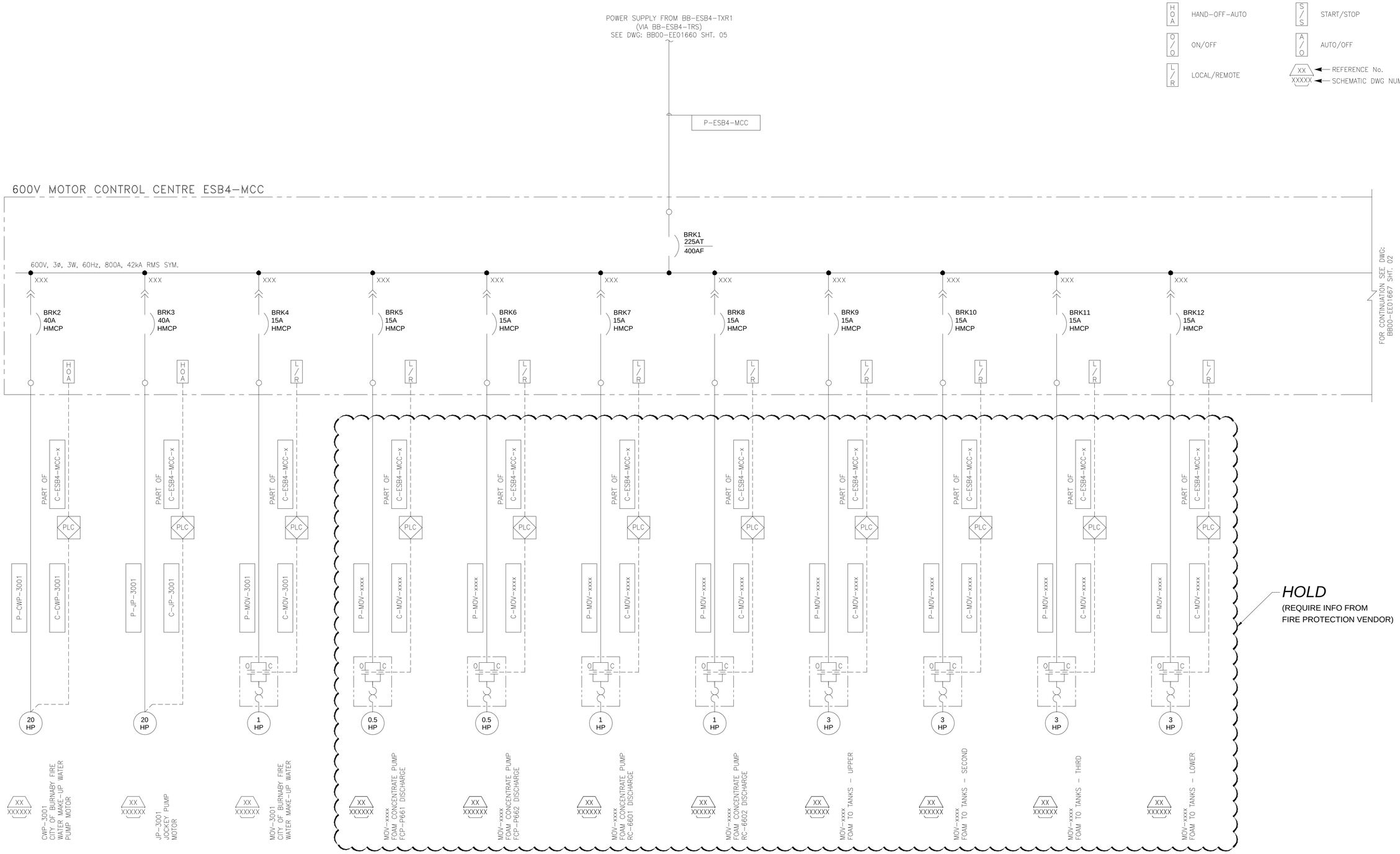
XXXXX	SCHEMATIC DWG NUMBER



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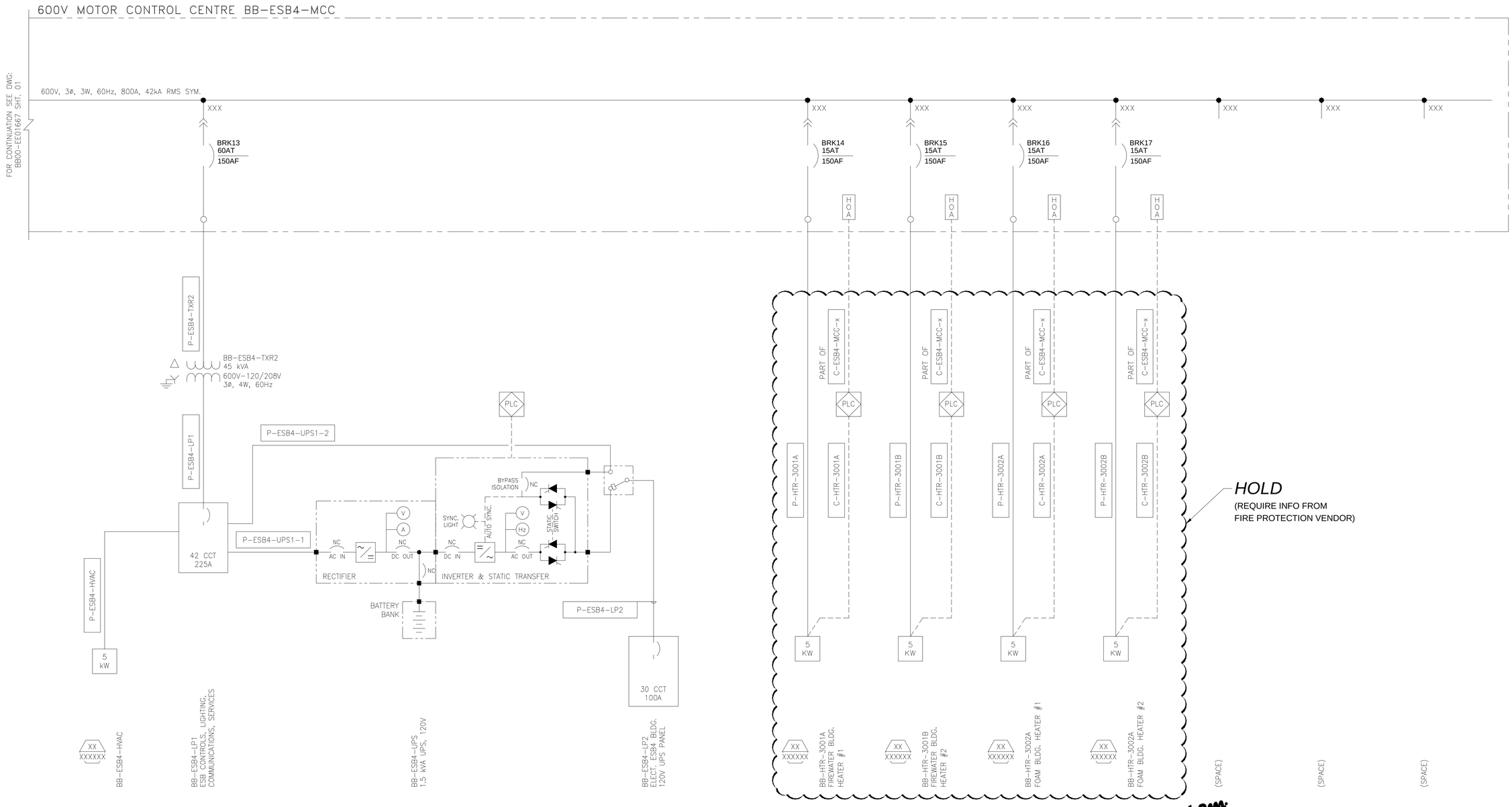
NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB4-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01667	01	C



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NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO	DATE	REVISION	DRN	CHK	APPR
			C	11JAN2017	ISSUED FOR DESIGN AFE #01-13283 (CH2M PROJ. #660356)	PB	RL	JE
			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
			A	30SEP2016	ISSUED FOR APPROVAL AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE

TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB4-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

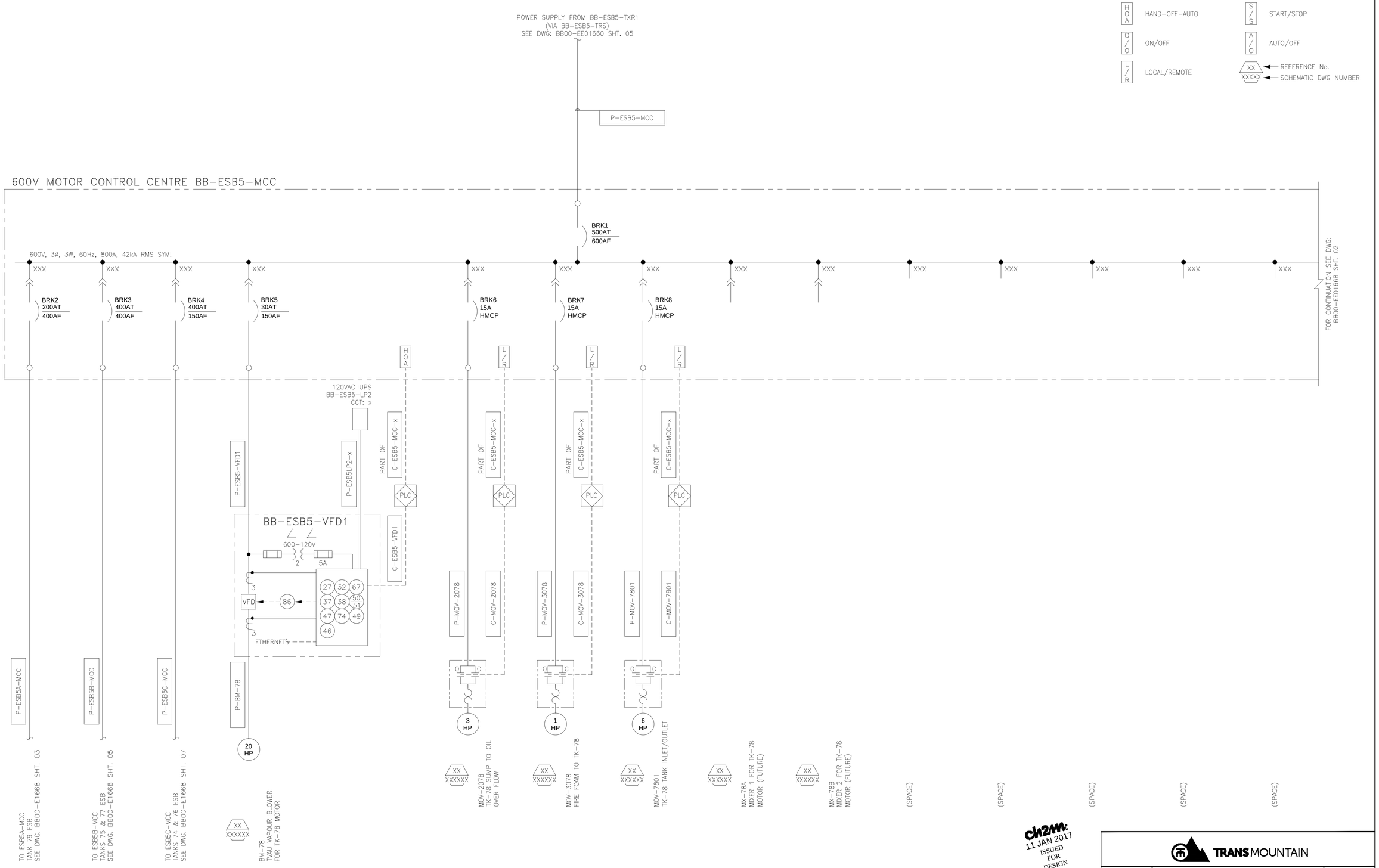
PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01667	02	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB5-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO	S / S	START/STOP
O / O	ON/OFF	A / O	AUTO/OFF
L / R	LOCAL/REMOTE	XX ← REFERENCE No. XXXXX ← SCHEMATIC DWG NUMBER	



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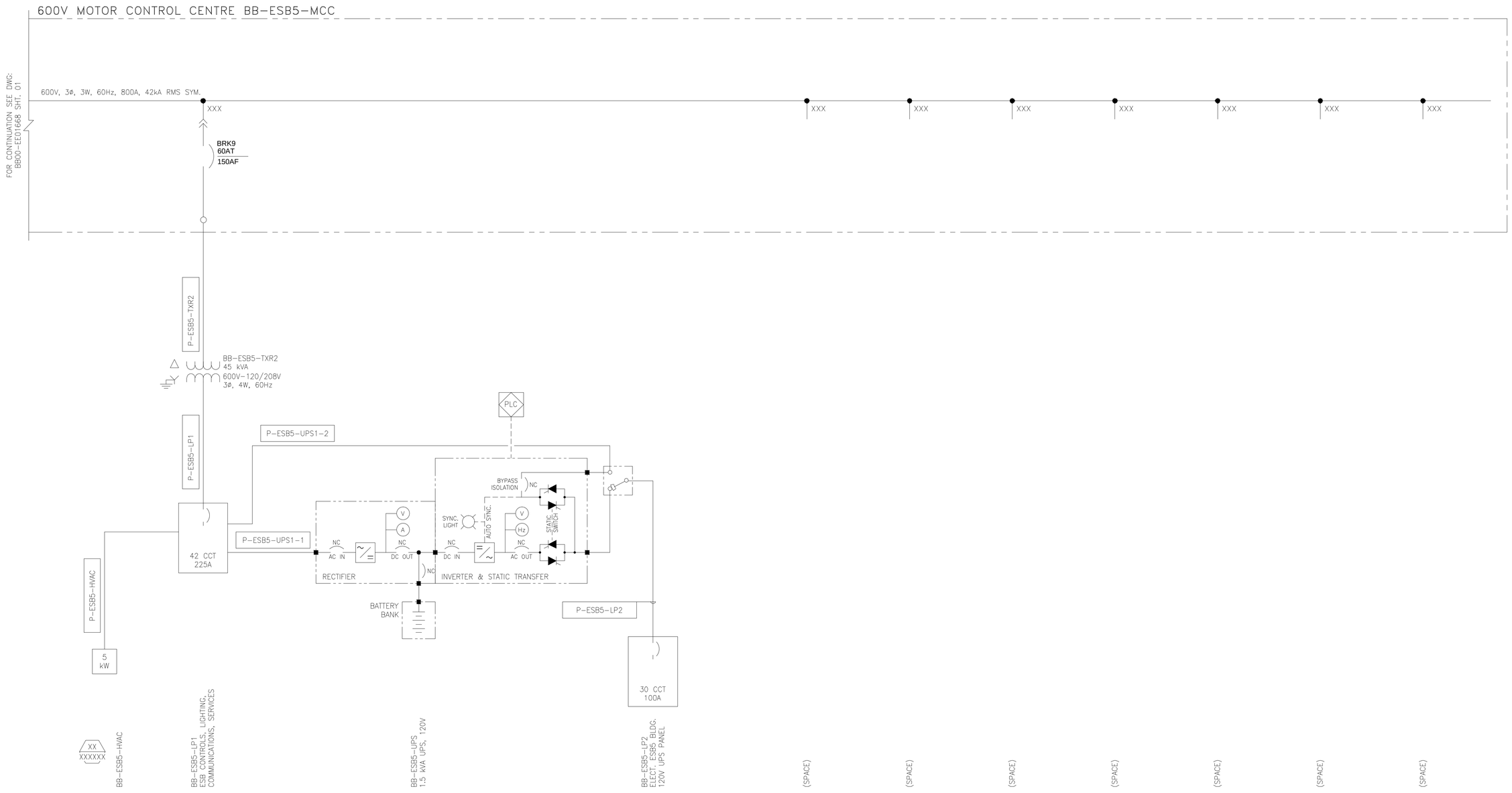
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01668	01	C



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TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

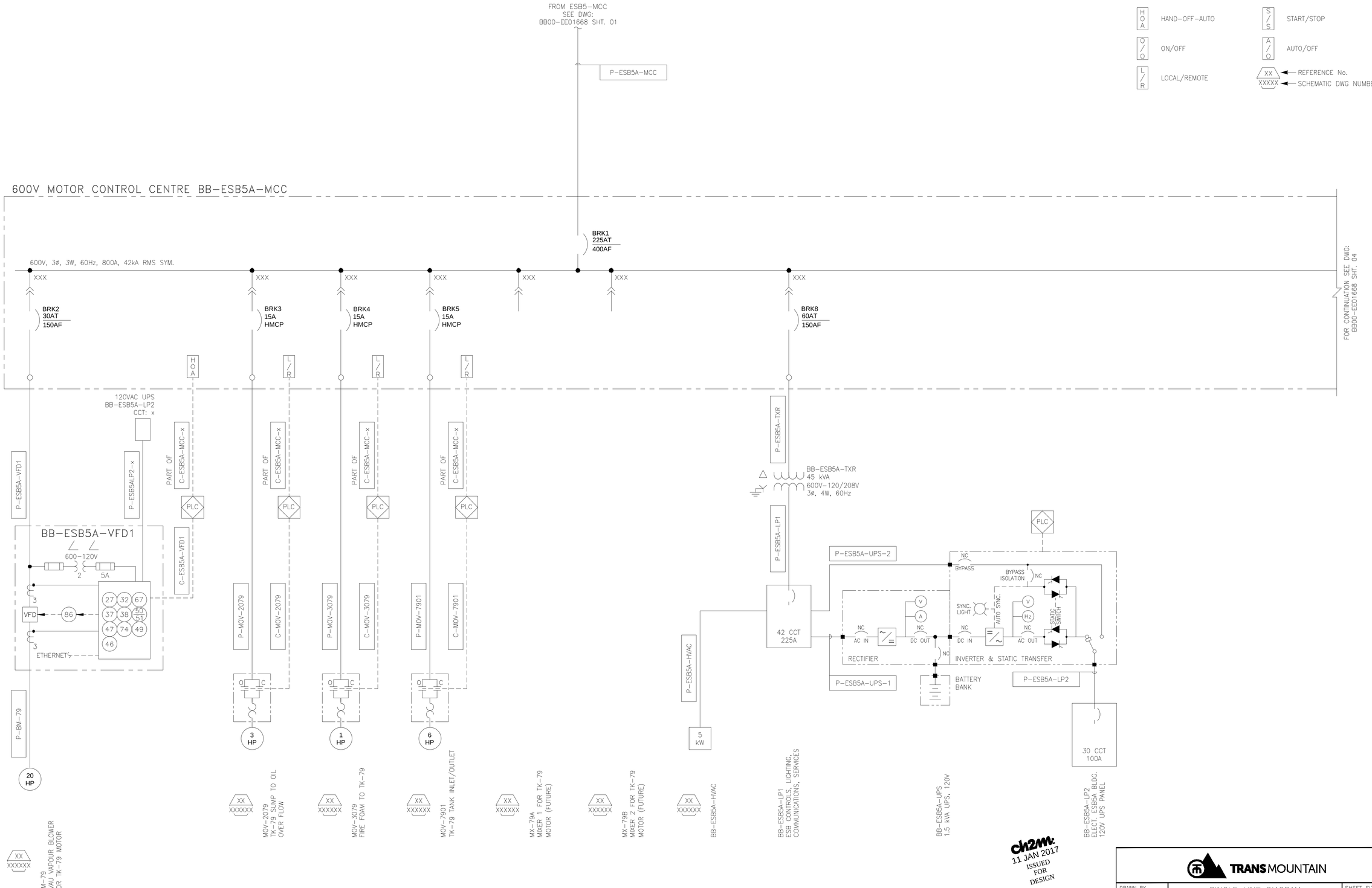
PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01668	02	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB5A-MCC-".

LEGEND:

H O A	HAND-OFF-AUTO	S / S	START/STOP
O / O	ON/OFF	A / O	AUTO/OFF
L / R	LOCAL/REMOTE	XX / XXXXX	REFERENCE No. / SCHEMATIC DWG NUMBER



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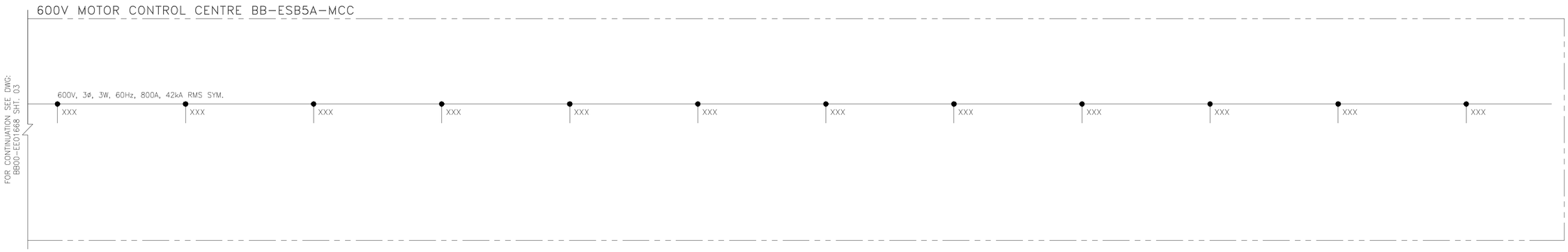
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5A-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER				
AFE	FACILITY ID	DOCUMENT NO		SHT NO	REV
01-13283	BB00	—	EE01668	03	C



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TRANS MOUNTAIN

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CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01668	04	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB5B-MCC-".

LEGEND:

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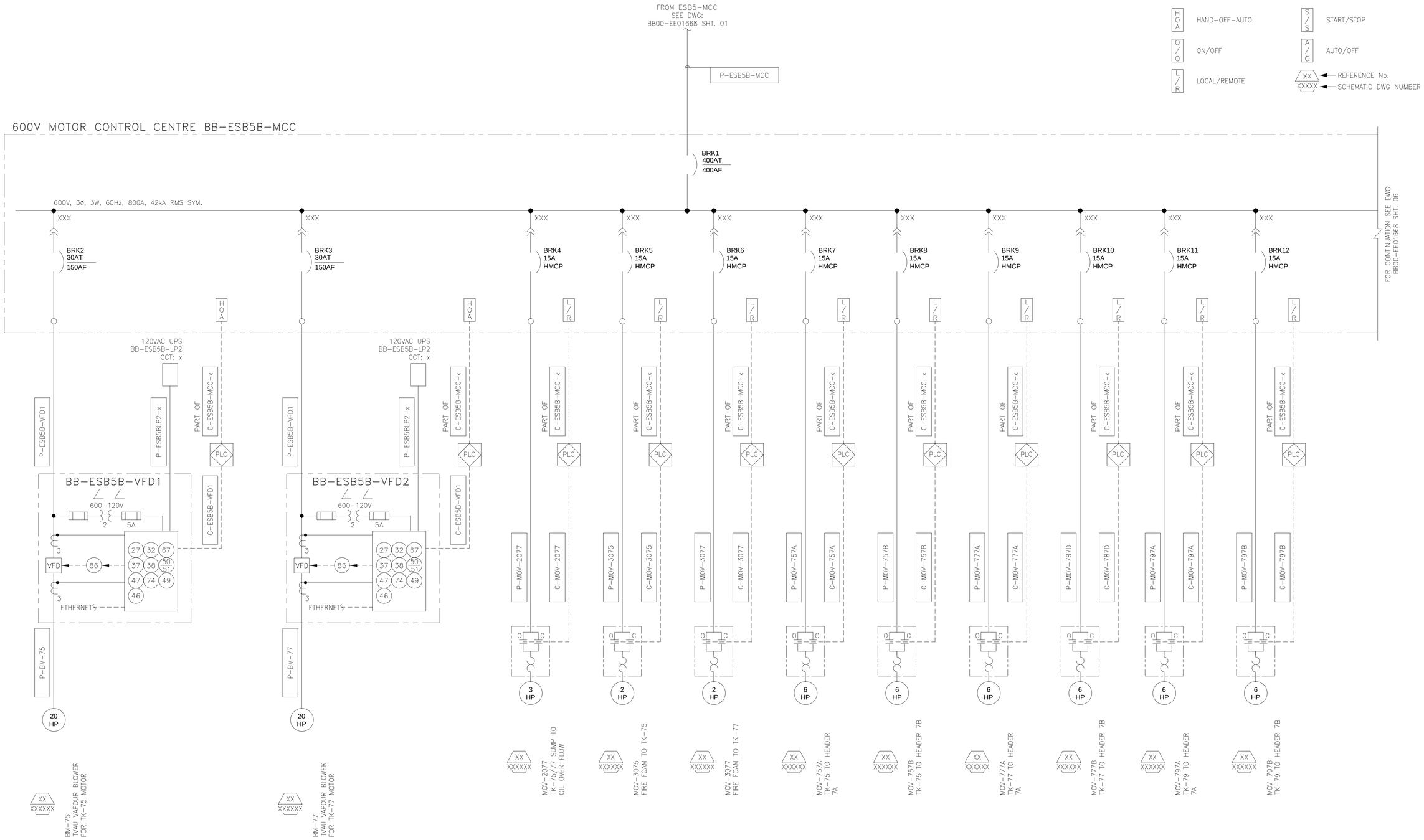
O / O	ON/OFF	A / O	AUTO/OFF
L / R	LOCAL/REMOTE	XX / XXXXX	REFERENCE No. / SCHEMATIC DWG NUMBER



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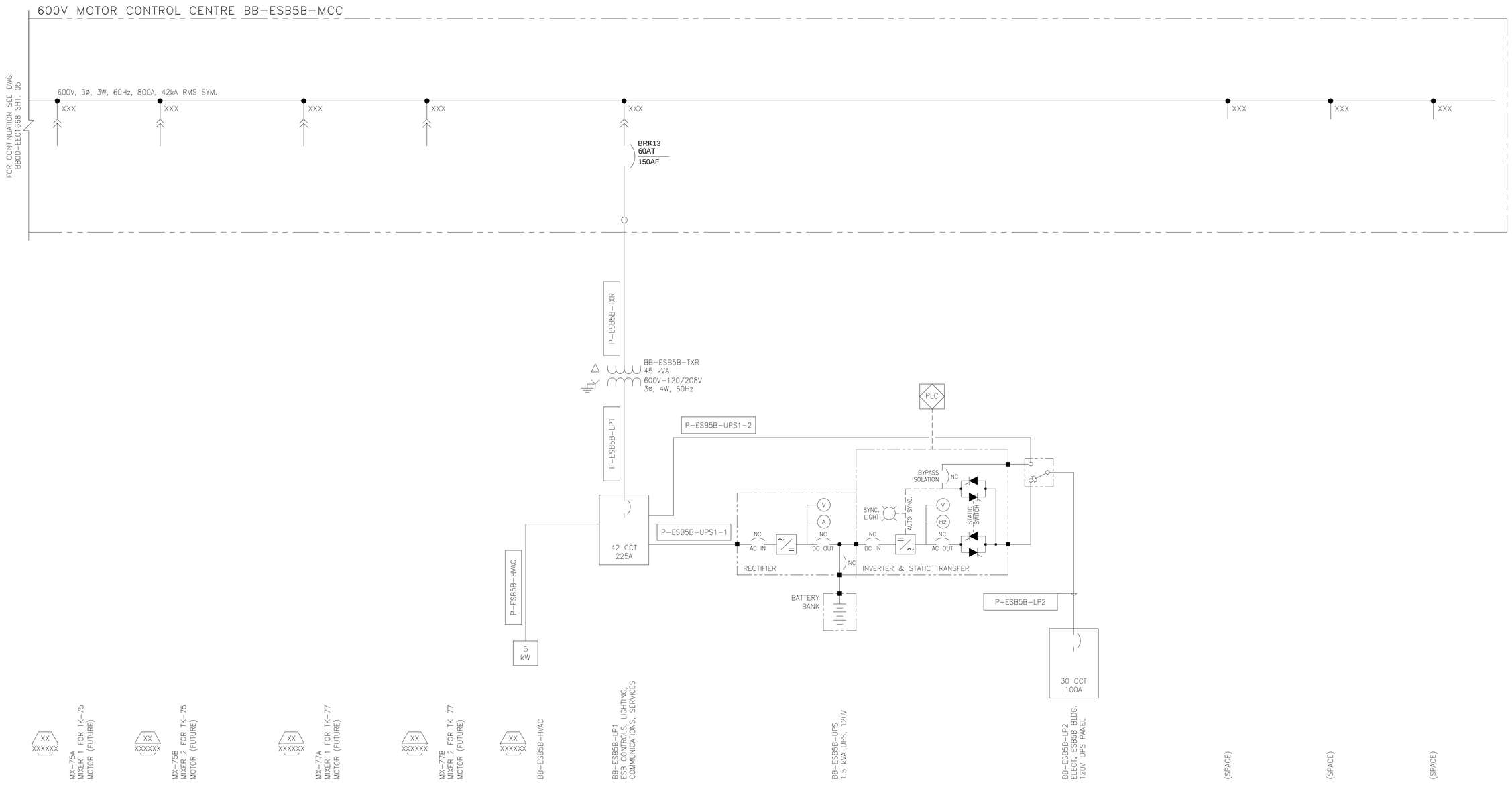
TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5B-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00	EE01668	05	C



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TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5B-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01668	06	C

NOTES:

1. MCC BREAKER TAGS TO BE PREFIXED WITH "BB-ESB5C-MCC-".

LEGEND:

H/O/A	HAND-OFF-AUTO
O/O	ON/OFF
L/R	LOCAL/REMOTE
S/S	START/STOP
A/O	AUTO/OFF
XX	REFERENCE No.
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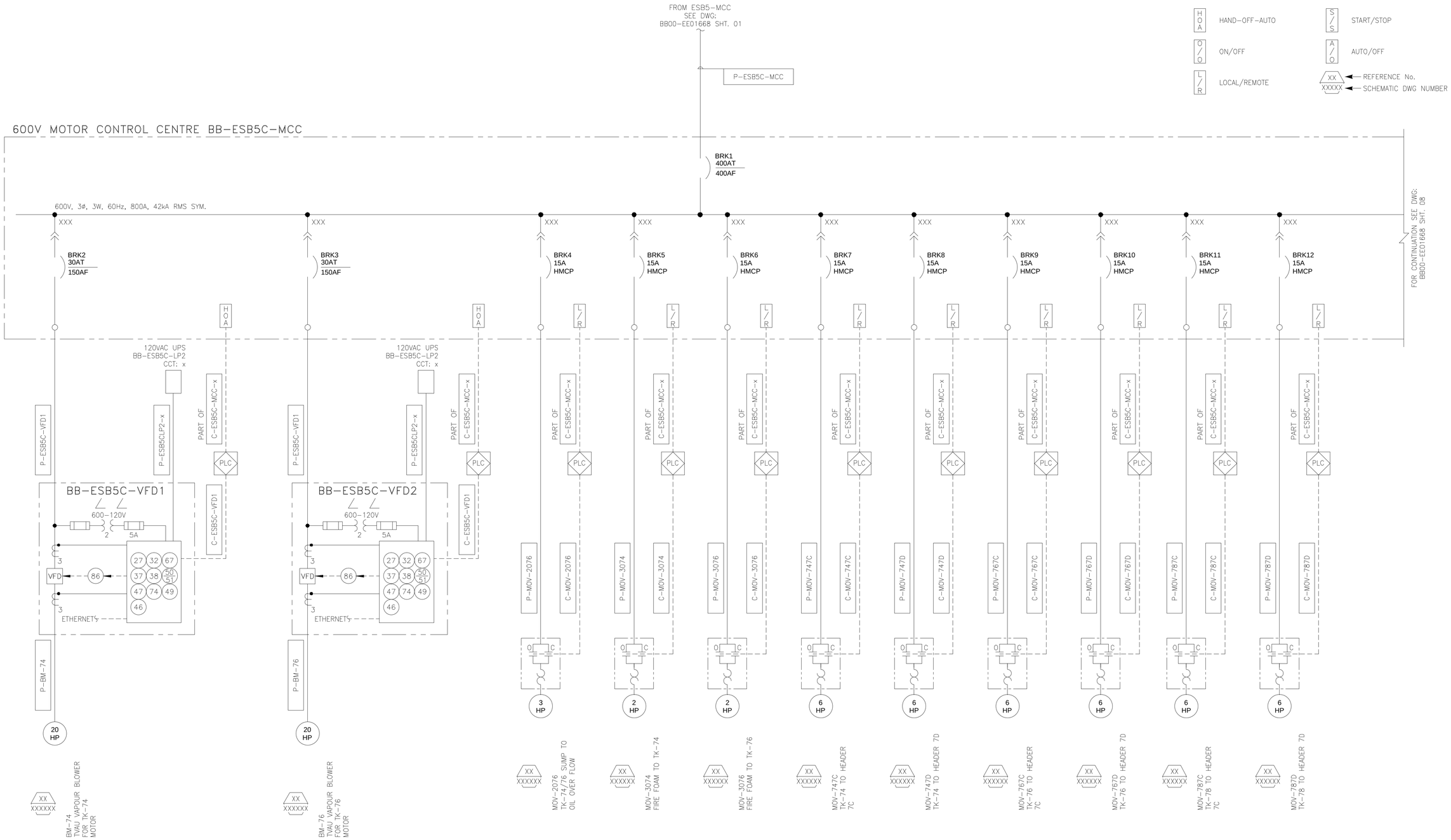

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			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
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TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5C-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

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AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
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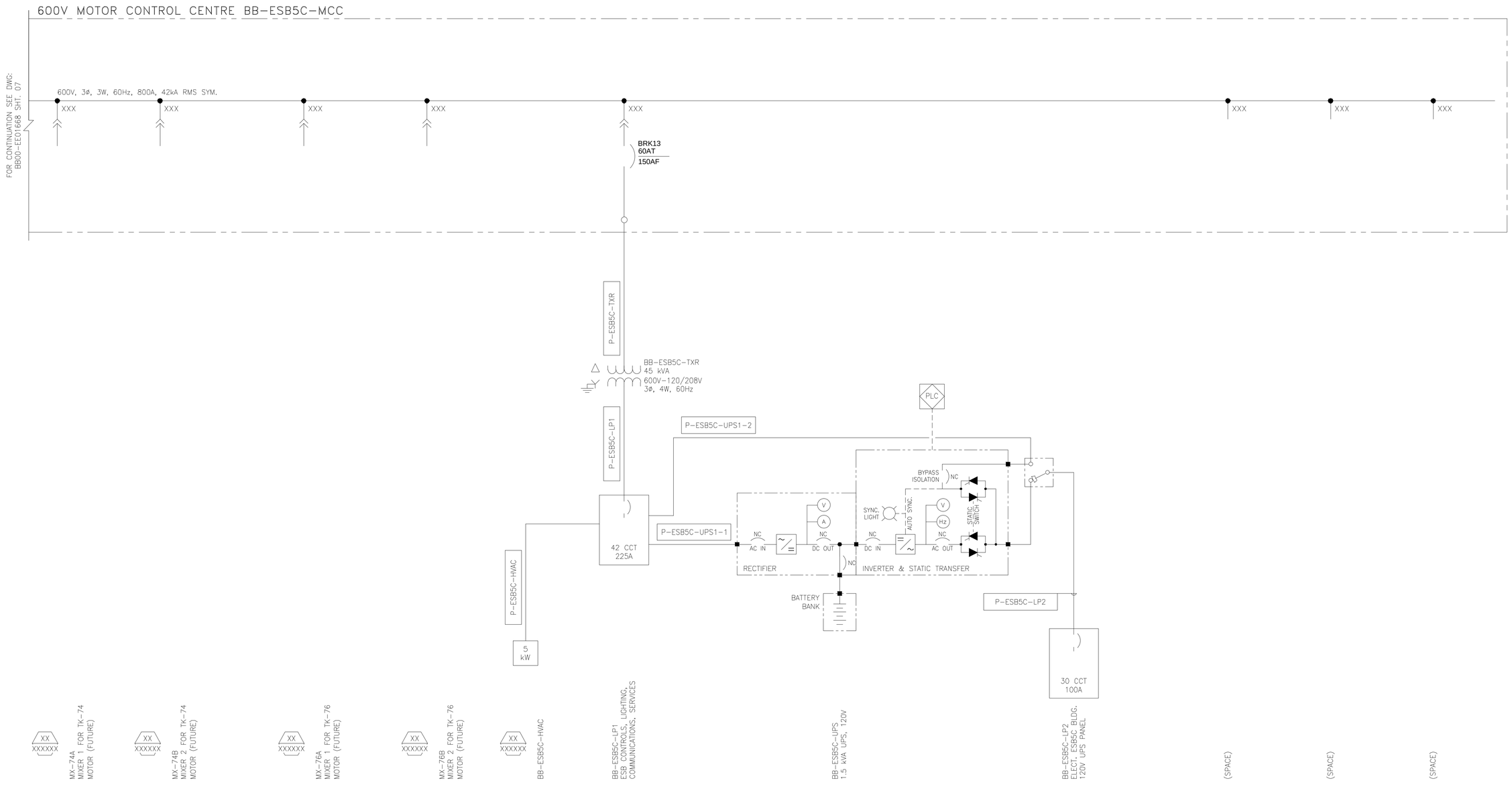

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			B	13DEC2016	RE-ISSUED FOR REVIEW AFE #01-13283 (CH2M PROJ. #660356)	NY	RL	JE
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TRANS MOUNTAIN

DRAWN BY N. YOUNG	SINGLE LINE DIAGRAM 600 VOLT DISTRIBUTION BB-ESB5C-MCC TMEP BURNABY TERMINAL	SHEET SIZE A1
CHECKED BY R. LEE		SCALE NTS
APPROVED BY		DATE 2016/09/23

PROJECT CODING	DRAWING NUMBER			
AFE	FACILITY ID	DOCUMENT NO	SHT NO	REV
01-13283	BB00 —	EE01668	08	C